EFFECT OF DIFFERENT AGRICULTURAL PRACTICES ON THE PRODUCTIVITY OF SOME PROSOPIS SPECIES GROWN UNDER RAS SUDR CONDITIONS

By

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ABSTRACT

Field experiment was carried out at Ras Sudr Research Station, Desert Research Center, at South Sinai Governorate in spring and autumn seasons during 2005 and 2006 years.

Experiment was designed and implemented to invegetative growth behaviour, evaluate yield and chemical composition of two Prosopis species (*Prosopis chilensis* and *Prosopis juliflora*) at three distances between plants 2, 3 and 4 meter (1050, 700 and 525 plant/fed) and four biofertilizer treatments (control, Rhizobium, Rhizobium + Azospirillum and Rhizobium + Azotobacter).

Experiment was layed out and statistically analyzed as split split plot design. Two individual cuts (as browsing simulation) were obtained during spring and autumn seasons in each of the two growing years. The studied parameters were as follows. Plant height (cm), stem diameter (cm), height of starting point of branching (cm), number of branches/plant, fresh and dry fodder weight / plant, fresh and dry fodder yield (kg/fed), crude protein (CP%), crude fiber (CF%), ash content, nitrogen free extract (NFE%), total digestible nutrients (TDN%) and digestible protein (DP%). Results for the experiment were recorded and presented in details.

The *Prosopis chilensis* was superior than *Prosopis juliflora* in their plant heights, stem diameter, height of the initiative branching point, number of branches / plant, fresh and dry weight g / plant, CP %, TDN % and DP %. Whereas, an opposite situation was noticed in their ash and crude fiber contents with significant differences in most cases of the different seasons.

It is generally noticed that plant height, stem diameter, number of branches / plant, fresh and dry weight / plant, CP % and TDN % were significant for medium distance (3m-700 plant / fed) during the most different seasons.

Whereas, the narrowest distance (2 m- 1050 plant / fed) gave the highest values of height of the initiative branching point, fresh and dry fodder yield and ash content.

Meanwhile, biofertilizer treatment (Rhizobium + Azotobacter) gave the highest value of Plant height (cm), stem diameter (cm), height of the initiative branching point (cm), number of branches/plant, fresh and dry weight g / plant, fresh and dry fodder yield (kg/fed), CP%, ash content, NFE%,TDN % and DP%.

It could be concluded that 3 meter distance between plants fertilized with Rhizobium + Azotobacter produced the highest values of plant height, stem diameter, number of branches / plant, fresh and dry weight / plant, CP %, TDN % and DP % in this experiments for *Prosopis chilensis* than *Prosopis juliflora* with significant differences in most cases of the different seasons.

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INTRODUCTION

INTRODUCTION

Arid and semi-arid regions represent about 30% of the total global land surface, and could contribute significantly to the agricultural production, considering constraints limiting factors for growth and production were paved away.

Sinai region mainly comprises about 61000 Km^2 of misused range land where the scanty vegetation cover provide limited grazing for livestock. In winter season, there are some annual and perennial fodder species flourish depending upon few rain on a narrow belt parallel to the coast. While during the summer period, there is almost a complete absence of green fodder where animals face a serious deficiency in feed stuff in respect of quantaty and quality.

Plants of the genus ***Prosopis*** are usually grow into poor soils, but they also thrive in fine sand or roky soils where the edaphic environments is not so conventent. In the North west coastal belt of Egypt, ***Prosopis juliflora*** was introduced and grown successfully on sandy (siliceous) calcareous soil and coastal sand dunes.

It is worth motived that ***Prosopis spp***. provide feed and shelter for livestock in many areas of the world. Pods are relished by camels, cattle, sheep and goats. Their pods are also useful when dried and grounded into meal. Its leaves are usually browsed by most of animal species, particularly when it is young and tender. Moreover, pods can be collected and stored for later use during the critical stages of feed deficiency.

The nutritional value of ***Prosopis spp***. can be more or less comparable to that of barley and maize seeds. Mature tree may produce about 80 kg of pods/year. Moderately sized tree produces more than 45 kg of dry leaf forage.

This study was mainly designed and implemented to shed some light on establishment, development and production of two Prosopis species under Ras Sudr conditions as a reasonably accepted source of feed.

The experimental area is characterized as calcareous soils of saline irrigation water. Developmental changes and yield of Prosopis species under different plant spacing and biofertilizer treatments were of main consideration in this study.

Experiments were conducted to evaluate the potentialities of two types of Prosopis (*Prosopis chilensis* and *Prosopis juliflora*) in respect of establishment, growth behaviour and productivity as well as its quality in respect of its chemical constituents. The nutritive analysis (as a reasonable feed materials under the harsh environmental and edaphic limitations) were under careful consideration during the different growing seasons for two subsequent years.

REVIEW OF LITERATURE

Review of literature in this study will be presented into the following main topics :

A- Effect of prosopis species:

1-Growth characteristics:

Goel and **Behl (1995)** reoprted that *Prosopis alba* revealed a significant superiority in growth rate compared with *Prosopis juliflora, Prosopis cineraria* and *Prosopis glandulosa.* On the other hand, **Alejandro *et al.* (2000)** reported that *Prosopis chilensis* gave highest dry weight as compared with *P. argentina*, *P.alpataco*, *P.flexuosa* and *P.pugionata*. In addition, **Vilela** and **Ravetta (2000)** found that seedlings obtained from the progeny of one *P.flexuosa* tree were taller than those from several *P. alba* and *P. glandulosa* trees at 8 months, but *P. glandulosa* and *P. alba* were taller and accumulated more biomass when measured at 27 months of age.

In another study, **Vilela** and **Ravetta (2001)** indicated that the addition of nutrients increased plant height only in *Prosopis chilensis* and *Prosopis alba* as compared with *P. velutina. P. pubescens* and *P. flexuosa,* also *Prosopis pubescens* invested more dry matter in leaves while *P. velutina* partitioned less of its biomass to leaves than other species.

Harrisa *et al.* (2003) showed that *Prosopis juliflora* gave the highest value of growth rate as compared with *Prosopis pallida*. On the other hand, **Vilela *et al.* (2003)** suggested that low-water availability induced a decrease in growth in *Prosopis alba, Prosopis flexuosa*–tree and *Prosopis flexuosa*-shrub but not in *Prosopis strombulifera*. In addition, **Villagraa** and **Cavagnarob (2006)** studies the effects of water stress on the early seedling growth of *Prosopis argentina* and *Prosopis alpataco.* They reported that the level of water supply affected the growth of *P. argentina* and *P. alpataco* plants in all of the evaluated variables. The height of *P. alpataco* decreased more than that of *P. argentina* under water stress conditions. While, plants of both species showed a decrease in biomass of leaves, stems and number of leaves under water stress conditions, this decrease was stronger in *P. alpataco* than in *P. argentina* as indicated by the significant species-irrigation level interactions and the higher proportional growth reached by *P. argentina* compared to *P. alpataco* under water stress.

2-Fresh and dry fodder yield:

Peter *et al.* (1989) studies the biomass production of *Prosopis alba* clones at two non-irrigated field sites. They found that *Prosopis glandulosa* var. torreyana clone B9V18 had the greatest total biomass as compared with *Prosopis alba* (B2V50). Moreover, **Duff *et al.* (1994)** cleared that the biomass productivity of *Prosopis alba* cv.0166 was significantly greater than that of native *Prosopis glandulosa* families in the first 4 years of the trial. In addition, **Goel** and **Behl (1995)** indicated that *Prosopis alba* variety produced heavier biomass than *Prosopis juliflora, Prosopis cineraria* and *Prosopis glandulosa.* Also, **Vilela** and **Ravetta (2000)** reported that *P. chilensis* accumulated significantly more biomass in all radiation environments than the other species as *P. glandulosa, P. flexuosa* and *P. alba.* While, **Vilela** and **Ravetta (2001)** cleared that *P. pubescens* accumulated significantly less total biomass than the other species, where the highest values were found in *P.alba* and *P.chilensis.*

Along the same line, **Deans *et al.* (2003)** found that *Prosopis juliflora* produced more biomass than the other species as *Prosopis cineraria* and *Prosopis chilensis.* Also, **Vilela *et al.* (2003)** observed that *Prosopis alba* surpassed *Prosopis flexuosa* –tree, *Prosopis flexuosa*-shrub and *Prosopis strombulifera* in total biomass accumulation. Meanwhile, **Cariagaa *et al.* (2005)**

mentioned that total biomass productivity was significantly higher in *Prosopis denudans* than in *Prosopis alpataco*.

3- Chemical composition:

Vilela and **Ravetta (2000)** showed that protein content was about half in stems compared to leaves the reduction in light availability increased the protein content in leaves in *P. glandulosa* and *P.flexuosa* from full-sun to 52% sun, and in *P. chilensis* and *P. alba* throughout the range of radiation. Protein content increased throughout the range of light availability in stems of *P. alba* and *P.flexuosa*, as well as in the roots of *P. glandulosa, P. alba,* and *P. chilensis,* while total carbohydrate content in shoots decreased with reductions in light availability in all species except *P. chilensis.*

Along the same line, **Gabriele *et al.* (2001)** observed that protein complexes seemed to be more stable in *P. tamarugo* than in *P. chilensis*. Thereafter, **Jorge *et al.* (2001)** indicated that plant tissue of *Prosopis caldenis* has higher protein percentage than *Prosopis flexuosa.* Moreover, **Vilela** and **Ravetta (2001)** suggested that leaf green tissue of *P. pubescens* has higher nitrogen contents than *P. velutina, P. alba, P. chilensis* and *P. flexuosa.* In this respect, **Deans *et al.* (2003)** found that *Prosopis juliflora* had the smallest concentrations of nitrogen content in wood as compared with *Prosopis cineraria* and *Prosopis chilensis.* Also, **Vilela *et al.* (2003)** showed that *Prosopis alba* revealed a significant superiority in carbohydrates, nitrogen and crude fiber percentage compared with *Prosopis flexuosa* and *Prosopis strombulifera* under high-water availability.

B- Effect of plant spacing:

1-Growth characteristics:

Hammerton (1971) mentioned that increasing area per plant from 0.21 to 2.32 m^2 plant height per plant of two dwarf pigeon pea decreased significantly.

While, **Laxman *et al.* (1971)** studies the effect of plant population density on growth and maturing variety of pigeon pea, they found that ther was no significant differences in plant height owing to plant population and row spacing. Significant differences were found in primary and secondary branches under plant population.

Moreover, **Ahlawat** and **Saraf (1981)** on pigeon pea pointed out that fresh and dry weight of shoot were affected with increasing plant densities in the range of 50,000 and 150,000 plants/ha. In addition, **Dutt (1981)** studied the growth of Hawaiian Giant *Leucaena leucocephala* var. He found that plant height and stem diameter increased with increasing spacing from 1x1 to 2x2 m / plant. Also, **Heilman** and **Peabody (1981)** indicated that increasing plant spacing from 30 x 122 to 122 x 122 cm significantly increased both plant height and stem diameter for cottonwood (*Populus trichocarpa*). Also, **Singh** and **kush (1981)** observed that plant height and stem diameter of pigeon pea decreased in 50x20 cm spacing as compared 150x50 cm spacing.

Small (1981) found that plant density at 6727 trees/ha gave the highest growth rate of *Terminalia arjuna* plants as compared with the 26 908 trees/ha. While, **Tayo (1982)** concluded that there was reduction in the growth characters of pigeon pea as population density increased. Thereafter, **Rupert (1984)** mentioned that pigeon pea cultivars differ greatly in the number and angles of their branches when grown at different spacing dairly wide plant – to – plant spacings. He also revealed that branching in all cultivars is greatly reduced in dense planting.

Also, **Maghembe *et al.* (1986)** declared that stem diameter and plant height of *Leucaena leucocephala* increased by increasing plant spacing from 3 x 3 to 5 x 5 m. On the other hand, **Nimbkar *et al.* (1986)** observed that plant height of *Prosopis juliflora* increased by increasing plant denisty, while there was a reduction in stem diameter with increasing density. **Douglas *et al.* (1990)** on *Acacia nilotica* noticed that high density depressed stem diameter and number of stems.

In trials carried out by **El-Hossini (1990)** on *Cajanus cajan,* he found that widing inter-plant spacing tented to increase plant height, No. of branshes/plant and fresh and dry weights of leaves and stem per individual plant. In addition, **El-Deek *et al.* (1991)** observed that widening plant spacing of giant saltbush grown under saline condition from 1.5 to 3.0 m resulted mostly in a significant increase of plant height, number of branches / shrub, shrub diameter and fresh and dry weight / plant during spring and summer seasons.

In another study, **Gideon *et al.* (1991)** showed that two varieties of Leucaena grown at 1.5×3.0 m spacing gave higher growth than those grown at 1.5x1.5 m. On the other hand, **Cenpukdee** and **Fukai (1992)** found that pigeon pea at high plant density (based on four rows between cassava rows) had similar height to that at low density (based on two rows).

Karim and **Savill (1993)** studies the influences of spacing (2, 4, 6 and 8 m) on the early performance and biomass production of *Gliricidia sepium.* They reported that branch production / plant and fresh and dry weights of leaves and stems of *Gliricidia sepium* plants were significantly increased with the increase in plant spacing from 2 to 8 m between plants. While, **Ngo** and **Hao (1993)** suggested that the planting spacing of 50 x 50, 50x100 and 100 x 100 cm had no effect on the height growth rate of four legumes trees.

Moreover, **Puri *et al.* (1994)** on *Prosopis cineraria* and *Cicer arietinum* found a marked shoot and leaf biomass of *Prosopis cineraria* decreased with an increase in distance, and no influence of *P. cineraria* was noticed. In another study, **Sunil *et al.* (1994b)** pointed out that total biomass / plant of *Populus* *deltoides* plant decreased with increase in plant denisty from 208 to 2250 per hectare.

Khalifa (1996) showed that increasing spacing rates from 1.0 to 2.0 m increased height as well as fresh and dry weight of *Atriplex canescens* and *Acacia saligna*. On the other hand, height of surbs was significant decrease in winter by increasing spacing rates from 1.0 to 2.0 m.

Shashidhar *et al.* (1997) on *Curcuma longa* showed that widening inter-plant spacing tended to decrease plant height. While, **Alberto *et al.* (1998)** studies the growth and biomass accumulation in different plant parts (including root systems) of *Eucalyptus camaldulensis*, *E. urophylla* and *E. pellita* planted at three spacings (3×1.5 m, 3×3 m and 4×3 m) and three ages (15, 31 and 41 months). They found that as spacing increased, individual stems of three species increased in diameter and total biomass at age 41 months. Also, **Shengzuo *et al.* (1999)** showed that plant hieght of *Terminalia arjuna* under sodic soil increased markedly with increasing population density from 500 to 1111 trees / ha. In another study, **Srivastava *et al.* (1999)** investigated the effect of planting density (10000, 20000, 30000, 40000 and 50000 trees / ha. on growth and biomass productivity of *Terminalia arjuna*. They found that the highest tree was obtained with a plant population of 50,000 tree / ha compared with largest population of 10,000.

Moreover, **Droppelmann** and **Berliner (2000)** suggested that the tallest plant of *Acacia saligna* was obtained with a plant population of 2500 trees / ha compared with the plant population of 833 trees / ha. Also, **Vidal *et al.* (2000)** found that plant height of *Prosopis juliflora* increased by increasing plant population from 2000 to 3330 trees/ha.

Bignami *et al.* (2003) found that *Corylus avellana* grown at 5 x 4 m spacing gave higher growth than that grown at 2.5 x 4 m. However, **Goel** and

Behl (2004) revealed that plant height, stem diameter and number of stem of three leguminous species (*Acacia farnesiana, A. nilotica* subspecies *cupressiformis* and *Cassia siamea*) were marginally affected by population density (10,000, 20,000 and 30,000 plants/ha). Biomass / plant in *A. farnesiana* increased markedly with increasing population density from 10,000 to 30,000 plants / ha. Plants spaced at 10,000 plant/ha showed faster growth rate and higher productivity as compared to the same at 20,000 and 30,000 planting density.On the other hand, **Gopichnd *et al.* (2006)** studied the effect of plant spacing (25 x 25, 50 x 25 and 50 x 50 cm) on growth of *Curcuma aromatica.* They found that plants at 25 x 25 cm spacing showed significantly taller plant height than 50 x 25 and 50 x 50 cm spacing, thus 50 x 50 cm spacing recorded significantly lowest height. However, **Susumu *et al.* (2006)** suggested that the tallest plants of *Acacia mangium* were obtained with at low density, while number of stem increased by decreasing plant population. Also, **Bryla (2007)** studies the effect of plant spacing of 0.45 and 1.2 meter on highbush blueberry. He found that widing inter-plant spacing tented to increase number of berries per individual plant.

2-Fresh and dry fodder yield:

Hammerton (1971) revealed that fresh and dry yield of two dwarf pigeon pea lines were decreased as thearea per plant increased from 0.21 to 2.32 m^2. In another study, **Laxman *et al.* (1971)** cleared that there was a marked depression in the yield of pigeon pea with decreasing plant population from 60.000 to 50.000 plant / ha. Growing plants at low level of plant population (50,000 plant / ha) reduced the yield as compared to the high level (50,000 plant / ha). In addition, **Guevara *et al.* (1978)** reported a decrease in annual total dry matter yield of *leucaena leucocephala* at wider plant spacing. Meawhile, **Bhgwan** and

Kalra (1980) found that pigeon pea plant grown at 10 x 60 cm spacing gave higher yield than those grown at 20-30 x 60 cm.

Kaul *et al.* (1980) mentioned that increasing plant spacing from 25 to 75 cm depressed the total yield of pigeon pea plants. Moreover, **Marchi *et al.* (1981)** studied the effect of different row spacing, viz. 0.5, 1.0 and 1.5 m apart with hill spaced 0.05 or 0.2 m apart. They found that DM production was highest with a 0.5 m spacing rows (5.94 t DM /ha) and lowest with a 1.5 m spacing (3.82 t / ha) and green matter production followed the same trend. They also mentioned that closely spaced plants produced more fresh green matter and DM than plants further apart. The same result was obtained by **Rowden *et al.* (1981)** whom they notice that dry yield of pigeon pea plant was significantly increased by increasing population density of plants. Also, **Small (1981)** reported an average increase in leaf yield of *Melaleuca alternifolia* in the highest population (26 908 trees/ha) compared with the lowest (6727 trees/ha).

Marchi *et al.* (1982) showed that fresh and dry matter yields of pigeon pea plant were decreased from 3.71 to 2.24 t / ha and from 13.03 to 7.98 t / ha with increasing row spacing from 0.5 to 1.5 m apart, respectively. While, **Tayo (1982)** studies the effect of plant population of 27000, 55000 and 83000 plants / ha. On productivity of pigeon pea plants under lowland humid tropical conditions. He reported that maximum productivity of pigeon pea was obtained from high plant population (83000 plants / ha). In addition, **Singh *et al.* (1983)** found that increasing spacing row up to 50 cm significantly decreased stalk yields of pigeon pea plants. On the other hand, **Wallis *et al.* (1983)** on pigeon pea mentiontd that raising plant population from 167000 to 500000 plants/ha. increased total yield from 2.74 to 3.80 t/ha. In another study, **Maghembe *et al.* (1986)** showed that the lowest spacing of 3 x 3 gave the highest volume of total biomass of *Leucaena leucocephala*.

Nimbkar *et al.* (1986) on *P. juliflora* plant, noticed that total biomass increased at 3 × 1 m as compared with 5 x 0.6 m. Moreover, **Raut** and **Gill (1987)** cleared that dry matter yield of *leucaena* decreased with an increase in distance. Also, **Malcolm *et al.* (1988)** planted five Atriplex species as seedlings on salt-affected agricultural soil at spacings of 1×1, 1×2, 2×2, 2×3 and 3×3 m. They found that after 20 months there were highly significant differences in yield between the 5 species at the wider spacing but there was no significant difference at 1×1 m. Among species with the largest bushes, *A. amnicola* gave the highest dry matter yield at spacings of 2×1, 2×2, 2×3 and 3×3 m. In another study, **El-Hossini (1990)** recorded that fresh and dry yields of leaves and stem of pigeon pea increased significantly by increasing hill spacing from 20 to 60 cm between hills. On the other hand, **Bheemaiah *et al.* (1992)** showed no significant differences in yield of arable crops among different plant spacing. However, **Karim** and **Savill (1993)** cleared that total biomass per hectare of *Gliricidia sepium* plants increased by decreasing plant spacing from 8 to 2 meter.

Ngo and **Hao (1993)** studies the effect of plant spacing of 50x50, 50x100 and 100x100 cm on growth and yield of four legume trees (*Erythrina variata*, *Erythrina variata*, *Acacia mangium* and *Gliricidia sepium*). They found that *Acacia mangiun*, planted with at 50 x 100 , gave the highest yield of fresh matter after one year. **Puri *et al.* (1994)** suggested that total biomass of *Prosopis cineraria* and *Cicer arietinum* decreased with the increase in distance between plants. However, **Sunil *et al.* (1994b)** declared that the total biomass increased from 71.50 tons / ha to 251.50 tons / ha with decreasing plant spacing from 6x6 m to 2x2 m, respectively. On the other hand, **Chandramala *et al.* (1996)** pointed out that increasing plant spacing rates from 4 to 6 meter significantly decreased green fodder and dry matter yield of *Cenchrus glaucus* plants for the first and fours cuttings, while four meter in plant spacing (2500 plants/ha) recorded higher green fodder and dry matter yield of Subabul plants (*Leucaena leucocephala*) as compared to 6 m (1667 plants /ha) in all the four cuttings.

Khalifa (1996) observed that increasing spacing rates from 1.0 to 2.0 meter significantly decreased forage yield of *Atriplex canescens* and *Acacia saligna* in all seasons. In another study, **Alberto *et al.* (1998)** mentioned that total biomass production of *Eucalyptus camaldulensis*, *E. urophylla* and *E. pellita* per hectare decreased by increasing plant spacing from 3 x 1.5 m to 3 x 4 m at age 41 months. Moreover, **Shengzuo *et al.* (1999)** showed that plant density at 1111 trees/ha gave the highest values of total biomass of *Terminalia arjuna* plants.

Srivastava *et al.* (1999) studied the effect of plant population on the growth and total biomass of *Terminalia arjuna*. They mentioned that total biomass increased with the decrease in plant spacing from 10.000 to 30,000 trees/ha. While, **Bignami *et al.* (2003)** showed that yield of hazelnut cultivar (*Corylus avellana*) significantly decreased by increasing the plant spacing from 2.5 x 4 to 5 x 4 m.

Along the same line, **Goel** and **Behl (2004)** studied the productivity assessment of three leguminous species under high-density plantations. They reported total marked biomass increase from 4.45 to 13.5 ton / ha of *A. farnesiana* with increasing population density from 10,000 to 30,000 trees / ha. Similar trend in biomass increase was observed in *C. siamea* when planted at higher densities. Hwoever, **Bryla (2007)** mentioned that higher densities (0.45 m) was used to improve yields harvested per acre.

3- Chemical composition:

Ahlawat and **Saraf (1981)** noticed that total nitrogen increased with increasing plant density of pigeon pea (*Cajanus cajan L.* Mill. Sp.). While, **Maghembe *et al.* (1986)** studied the effect of plant spacing on the total nutrient accumulation of *Leucaena leucocephala.* They mentioned that the lowest spacing of 3 x 3 m gave the highest nitrogen concentration in the total biomass compared with the widest plant spacing (5 x 5 m).

El-Hossini (1990) pointed out that crude protein and carbohydrate percentage of leaves and stem of pigeon pea was not influenced with widening distance between hills except in the first cut for crude protein percentage of leaves. In addition, **Sunil *et al.* (1994a)** reported that ash content and nitrogen percentage of *Prosopis cineraria* decreased at high density. However, **Chandramala *et al.* (1996)** found that crude protein yield was significant higher in 6 m distance of *Cenchrus glaucus* plants as compared to 4m, also in Subabul plants and Cenchrus + Subabul at 4 m plant spacing recorded higher crude protein yield.

In another study, **Khalifa (1996)** mentioned that *A.Canecens* cultivated at 1.0 m spacing produced a high carbohydrate content (20.25%). Meanwhile, *Acacia saligna* cultivated at 2.0 m gave the lowest carbohydrate (15.75%), while the effect of spacing on protein % was significant in spring and winter. Shrubs cultivated on shortened spacing gave high protein percentage as compared with shrubs cultivated on widened spacing. On the other hand, the application of widened spacing produce significantly higher increase in crude fiber % as compared with the application of shortened spacing in all seasons, but the accumulation of ash in tissues of *A.Canecens* and *A. saligna* under the effect of the applied spacing rates was not significant.

C- Effect of biofertilizer:

1-Growth characteristics:

Pathak and **Patil (1981)** studies the effect of inoculation with Rhizobium, with or without Mo supplementation, for 70 days for 3 cultivars of *Leucaena* *leucocephala* in pot experiments with local soil (pH 7.0). They reported that dry weight of all cultivars was greater in inoculated plants as compared with control (uninoculated plants). **Dutt** and **Urmila (1983)** inoculated *Leucaena leucocephala* was with 3 strains of Rhizobium where height and stem diameter per plant were measured after 24 and 30 months. They found that all of the 3 inoculats increased the studied growth parameters significantly as compared with uninoculated plants.

Similarly, **Sivaprasad** ***et al.*** **(1983)** mentioned that inoculation of *Leucaena leucocephala* with Rhizobium alone and to a greater with extent Glomus fasciculatum alone significantly increased growth over the uninoculated controls, best results were obtained with dual inoculations. In addition, **Hendronomo (1984)** cleared that Rhizobium inoculation increased growth of *Leucaena leucocephala* seedlings.

Along the same respect, **Chao** and **Young (1985)** found that Rhizobium strains inoculation significantly affected the growth of *Leucaena leucocephala* than uninoculated. Meanwhile, **Nastaran** ***et al.*** **(1985)** showed that mesquite shoot weight and root weight were all significantly increased when Rhizobium (strain AZ-M1) was the applied inoculation. Also, **Sanginga** ***et al.*** **(1985)** observed that growth of *Leucaena leucocephala* was improved by inoculation with effective rhizobial strain. Meanwhile, **Chang** ***et al.*** **(1986)** found that inoculation with both Rhizobium and G. fasciculatum resulted in the greatest seedling weight of *Acacia auriculiformis,* however, seedlings inoculated with only Rhizobium had greater shoot dry weight than control plants.

In other study, **Sanginga** ***et al.*** **(1986)** observed that inoculations with Rhizobium increased dry matter / plant of *Leucaena leucocephala* compared with the uninoculated ones. In similar study, **Basu** and **Kabi (1987)** reported that mixed inoculatins Rhizobium + Azotobacter chroococcum increased plant height and dry weight of *Prosopis juliflora* after 150 days from sowing compared with controls.

Cruz *et al.* (1988) observed that the most effect on *Acacia mangium* and *Albizia falcataria* when inoculated with Glomus fasciculatum + Rhizobium and Gigaspora margarita + Rhizobium which gave the highest growth compared with uninoculated plants. However, **Gunawardena** and **Pushpakumari (1988)** reported that seedling dry weights of *Leucaena leucocephala* were not significantly affected by Rhizobium inoculation. Along the same line, **Guzman *et al.* (1988)** showed that dry weight of shoots of *Leucaena leucocephala* was greater in inoculated plants with mycorrhizal + rhizobial symbiosis as compared with control (uninoculated plants). Moreover, **Mohammad (1988)** declared that triple inoculation with Rhizobium, Bacillus megaterium and Glomus fasciculatum increased seedling growth of *Leucaena leucocephala*, but Rhizobium alone was better than Bacillus megaterium and Glomus fasciculatum alone. In this respect, **Pan** and **Cheng (1988)** noticed that dual inoculation (Rhizobium + mycorrhizal fungus) significantly increased height and dry weight of *Leucaena leucocephala* compared with controls and those treated with Rhizobium alone.

Swaminath and **Vadiraj (1988)** studies the effect of Azospirillum (a nitrogen fixing bacterium) on 8 species (Leucaena leucocephala, Dalbergia sissoo, Acacia nilotica, Calliandra calothyrsus, Casuarina equisetifolia, Pongamia pinnata, Albizzia lebbeck [Albizia lebbek] and Eucalyptus hybrid [E. tereticornis]). They added that All species showed an increase in growth in treated seedlings compared with the controls.

Also, **Badji *et al.* (1989)** showed significant increase in plant height, diameter of the collar and dry weight of seedlings for *Acacia laeta* inoculated with Rhizobium and Glomus mosseae than uninoculated treatments. While,

Homchan *et al.* (1989) found that dry weight of *Leucaena leucocephala* was increased by inoculation at 20 weeks after sowing. Whereas, **Aziz** and **Habte (1990)** reported that stem diameter of *Sesbania grandiflora* did not respond to preinfection with either Rhizobium or Glomus aggregatum alone but was significantly increased by dual inoculation.

In another study, **Parrotta (1991)** indicated that mixed inoculation with Frankia+Rhizobium increased growth characters of *Casuarina equisetifolia, Eucalyptus tereticornis, Leucaena leucocephala* and *Sesbania sesban.*

Sivaprasad and **Rai (1991)** reported that soil inoculation with G. fasciculatum and Rhizobium sp. increased growth characters of pigeon peas plant compared with inoculation with Rhizobium alone. In another study, **Beniwal *et al.* (1992)** noticed that dual inoculation with Glomus mosseae and Rhizobium increased growth characters of *Acacia nilotica* compared with single inoculation with Rhizobium.

On the other hand, **Mallesha *et al.* (1992)** showed that dual inoculation with Rhizobium and vesicular-arbuscular mycorrhizal (VAM) showed to result in superior growth of *Leucaena leucocephala.* Thereafter, **Seikhon *et al.* (1992)** studies the effects of a hydrogen uptake positive (Hup) + strain of Rhizobium sp. and a vesicular-arbuscular mycorrhizal (VAM) fungus (Glomus fasciculatum) on pigeon pea (*Cajanus cajan*). They reoprted that the Hup + Rhizobium strain showed more plant biomass than the Hup- strain. Moreover, **Widiastuti** and **Toruan (1992)** found that Rhizobium and/or VAM fungi inoculation significantly increased the growth of Leucaena cultivars. Meanwhile, **Dixon *et al.* (1993)** noticed that in the absence of NaCl, plants inoculation with both VAM (vesicular-arbuscular mycorrhizae) and Rhizobium had significantly greater total dry weight of *Leucaena leucocephala* and *Prosopis juliflora* seedlings than seedlings inoculated with either of the symbionts alone.

Kaushik *et al.* (1993) noticed that seed inoculation with Bradyrhizobium increased shoot dry weight of pigeon pea (*Cajanus cajan L.* Mill sp). compared with the uninoculated ones. Meanwhile, **Valdes *et al.* (1993)** found that dual inoculations of *Leucaena esculenta* plants with either Glomus versiforme and Rhizobium loti NGR 8 or Glomus sp. and R. loti ENCB 31, resulted in greater growth compared with treatments with a single micro-symbiont.

Barua (1994) found that 125 g of Rhizobium mixed with 1 kg of seeds in a slurry, dried and sown in mother beds gave the best seedling growth of *Acacia nilotica.* Similarly, **Meshram *et al.* (1994)** observed that the best response in the case of *Prosopis juliflora* was to the Rhizobium LMg inoculum which improved seedling growth Also, **Sharma *et al.* (1994)** found that best seedlings growth of *Dalbergia sissoo*, *Acacia auriculiformis* and *Acacia catechu*, was obtained when rhizobial inoculation applied at 1 and 2 weeks after transplanting in the nursery (at 2 months old). The positive growth response was noticed at 3 months later. The outstanding response was for *A. catechu.* Inoculated seedlings had more effective nodules than the non-inoculated ones.

Tang (1994) showed that inoculation with Rhizobium strains IH-016 (Cuban) and IH-1020 increased dry weight of *Leucaena leucocephala* by 63% and 42% respectively. Also, **Toky *et al.* (1994)** reported that inoculation with Rhizobium exerted significant increase in the growth of *Acacia nilotica* plants compared with values of the non-inoculated plants. Meanwhile, **Verma *et al.* (1994)** suggested that inoculation with Rhizobium and VAM fungi increased height, growth, collar diameter, fresh and dry weights of shoot of *Acacia nilotica*. Moreover, **Kamla *et al.* (1995)** observed that Rhizobium japonicum [Bradyrhizobium japonicum] str. R-1121 gave the best growth response of *Acacia nilotica* for most of the studied growth parameters than the uninoculated (controls).

Ragini and **Nair (1996)** showed that shoot dry weight and plant height of *Acacia arabica* increased for the inoculated plant by Rhizobium than the uninoculated ones. In this respect, **Thapar *et al.* (1996)** found that inoculation with Glomus macrocarpum increased plant height of *Acacia nilotica* from 17.8% in pure sodic soil to 50.5% in mixed sodic soil (3:1) over 7 months, compared with control non-inoculated plants, while Rhizobium inoculation did not improve seedling growth, either alone or with VAM. Significant improvements in growth were also observed after inoculation in normal soil with the VAM alone treatment.

Jha (1999) clearly indicated that inoculation with Rhizobium species increased height, collar diameter and diameter at breast height of *Leucaena leucocephala* and *Sesbania sesban* compared to the control. Similar result was obtained by **El-Sayed (2000)** who mentioned that plant heights and number of branches of leguminous crops were obtained by mixed inoculation (Rhizobium + PDB) as compared with the uninculated plants. Thereafter, **Kamal (2000)** mentioned that Rhizobium and VAM inoculated *Acacia nilotica* plants showed much better growth than uninoculated plants, with significant differences between control and inoculated plants.

Sharma and **Ramamurthy (2000)** reported that there was a significant increase in growth of *Acacia auriculiformis* when seedling inoculated by Rhizobium and Bradyrhizobium strains compared with the control (uninoculated). Further more, **Vranjic *et al.* (2000)** showed that shoot growth of *Acacia sophorae* was increased by the addition of Rhizobium after 40 days from planting. In another study, **Abbas *et al.* (2001)** cleared that mixed inoculation (Rhizobium spp+ associative diazotrophs) gave a great value for the increase in growth of *Sesbania sesban* and *Leucaena leucocephala*.

Banyal *et al.* (2001) showed that Rhizobium inoculation significantly affected the growth of *Acacia catechu* and *Acacia mollissima*. It is suggested that among the various strains, inoculation with mixed strain (Uhf 76 + Sln 20 + Nhn 63) in *A. catechu* and *A. mollissima* is recommended. In addition, **Benbrahim** and **Ismaili (2002)** clarified the effect of single and dual inoculation with Rhizobium and arbuscular mycorrhizal fungi (AMF; Glomus mosseae) on growth of *Acacia saligna* plants. They observed that dual inoculation (Glomus mosseae and Rhizobium) significantly increased total dry weight, on the other hand, Rhizobium inoculation alone significantly increased shoot dry weight. **Devanand *et al.* (2002)** found significant increase in plant height of pigeon pea cultivars ICPL-87 and ICPL-87119 inoculated with Rhizobium sp. (GB-1), Azospirillum sp. (ACD-20) and Pseudomonas striata (strain no. 27). On the other hand, **Kayode** and **Franco (2002)** suggested that *Acacia mangium* inoculated with rhizobia strains BR 3609 and BR 3617 and three AMF, Glomus clarum, Gigaspora margarita and Scutellospora heterogama gave the best growth than seeds planted without rhizobia and AMF inoculate.

Niranjan *et al.* (2002) observed that the seedlings of *Prosopis cineraria* inoculated with Rhizobium (PC Rhz-5)+Glomus mosseae as twin symbionts recorded maximum enhancement of growth in comparison to tile seedlings inoculated with Rhizobium alone. Moreover, **Roomi *et al.* (2002)** reported that *Acacia ampliceps* seedlings inoculated with different strains of Rhizobium (TAL 569, TAL 1388, TAL 1881 and CB 3156) and irrigated with saline water (5-15 dS/m) showed marked increases in height of plants compared with the control (uninoculated), while strain (TAL 1881) produced the greatest plant biomass both under the non-saline and saline conditions.

Kamal (2003) recorded significant increase in growth, dry weight and number of leaves of *prosopis juliflora* over control when the test plants were subjected to Glomus fasciculatum or Rhizobium inoculation alone or in combination. In addition, **Scotti** and **Correa (2004)** mentioned that *Anadenanthera peregrina* which were inoculated with rhizobia (strain BHICB-A10) and associated with arbuscular mycorrhizas, showed significant increase in height over the uninoculated plants.

2-Fresh and dry fodder yield:

Chao and **Young (1985)** reported that inoculation with Rhizobium strains increased total dry matter of *Leucaena leucocephala.* In addition, **Tang (1985)** mentioned that inoculation with 3 strains of Rhizobium (IH-016, IH-024 and CB-81) gave the highest DM yield of *Leucaena leucocephala* compared with control. In another study, **Pahwa (1987)** showed that inoculation with a single Rhizobium strain increased green matter yield of *Leucaena leucocephala* by 6-21%, while inoculation with multiple strains (Jhansi-S-8, TAL-582 and LL-28-2) gave an increase of 24-37% green and dry matter herbage yields which were greatest with the 3-strain inoculation. Also, **Jainm *et al.* (1988)** observed that Inoculation with Rhizobium significantly increased total yield of Groundnuts and pigeon peas plants than in the (untreated) control.

Badji *et al.* (1989) mentioned that mixed inoculations of Rhizobium and Glomus mosseae gave increase in the total biomass of *Acacia laeta.* Moreover, **Aziz** and **Habte (1990)** suggested that shoot dry matter yield of *Sesbania grandiflora* was significantly increased by Rhizobium infection alone; increases with G. aggregatum alone were much less, with the best growth again in the dual inoculation treatment.

Costa and **Paulino (1990)** showed that inoculation with Rhizobium and/or the VAM fungus Acaulospora muricata increased dry matter yield of *Leucaena leucocephala.* However, **Costa *et al.* (1990)** pointed out that significant improvements in dry matter yield of *Cajanus cajan* occurred with Rhizobium or mycorrhizal, but the best results occurred with dual Rhizobium/mycorrhizal inoculation. Also, **Khasa *et al.* (1990)** suggested that dual inoculation with G. vesiculiferum, Glomus sp. Z2, Glomus sp. Z3 and Rhizobium sp. significantly increased the biomass of *Leucaena leucocephala*, *Phaseolus vulgaris*, soyabeans and pigeon peas. Meanwhile, **Singh *et al.* (1990)** found that shoot yield of pigeon pea (*Cajanus cajan*) was significantly increased due to Rhizobium sp. and Glomus fasciculatum, over the uninoculated (control).

Khurana and **Sharma (1992)** indicated that inoculation of *Cajanus cajan* seeds with Rhizobium strains IHA-195, A-19, A-2, IC-3100 and CC-1 increased dry matter production. While, **Seikhon *et al.* (1992)** showed that the Hup + Rhizobium strain gave the highest value of nitrogen content of *Cajanus cajan* than the Hup- strain.

On the other study, **Verma *et al.* (1994)** pointed out that inoculation of Rhizobium and VAM fungi enhanced the biomass production of *Acacia nilotica* compared the control seedlings. Moreover, **Thapar *et al.* (1996)** noticed significant increase of 166.7% in biomass (dry) of *Acacia nilotica* treated with VAM fungus (Glomus macrocarpum).

Balasubramanian and **Ravichandran (1997)** found that the highest biomass of 11.6, 6.0 and 8.5 g were recorded, respectively, in *Casuarina equisetifolia*, *Acacia nilotica* and *Eucalyptus tereticornis* when they were inoculated with Frankia + VAM, Rhizobium + VAM and Azospirillum + VAM, respectively. Along the same line, **Sujan** and **Singh (1997)** suggested that combined inoculations of VAM and nitrogen fixing organisms increased the total annual dry matter yield compared with non-inoculated plants of pigeon pea. Further studies showed that pigeon pea yield was increased by dual inoculation with Glomus fasciculatum and Rhizobium. However, **Bhattacharyya (1998)** on pigeon pea (*Cajanus cajan*) showed that the crop grown from seeds inoculated with Rhizobium was significantly higher. Meanwhile, **Banyal *et al.* (2001)** found that the highest total biomass of *Acacia catechu* and *Acacia mollissima* was obtained when using inoculation of mixed strains (Uhf 76 + Sln 20 + Nhn 63) than the control.

Devanand *et al.* (2002) declared that inoculation with Rhizobium sp. + Azospirillum sp. + P. striata increased total dry yield of pigeon pea cultivars. In another study, **Roomi *et al.* (2002)** observed that mixed inoculations of Rhizobium strains (TAL 569, TAL 1388, TAL 1881 and CB 3156) and irrigated with saline water (5-15 dS/m) gave increase in total biomass of *Acacia ampliceps*. Also, **Rodrigues *et al.* (2003)** studies the effects of arbuscular mycorrhizal fungi (AMF and AMF) and Rhizobium on dry matter production, N uptake and use efficiency in *Eucalyptus grandis* and *Sesbania virgata* plants grown in intercropping systems. They found that where plants grown for 100 days and then harvested. They recorded that in the *E. grandis* plants, the Rhizobium, AMF and AMF+Rhizobium treatments increased the dry matter production in the previously mentioned plants.

3- Chemical composition:

Tang (1985) noticed that the highest total nitrogen of *Leucaena leucocephala* was obtained by using inoculation with mixed Rhizobium strains (IH-016, IH-024 and CB-81) than uninoculated treatments. While, **Chang *et al.* (1986)** on *Acacia auriculiformis* suggested that seedlings inoculated with only Rhizobium had greater total nitrogen percentage than control plants, while inoculation with both Rhizobium and G. fasciculatum gave the highest nitrogen content. However, **Sanginga *et al.* (1986)** noticed that total nitrogen of *Leucaena leucocephala* was greater in inoculated plants with Rhizobium as compared with control (uninoculated plants). Also, **Guzman *et al.* (1988)** reported that mycorrhizal inoculation increased nitrogen contents of the aerial parts of *Leucaena leucocephala.* In addition, **Mohammad (1988)** pointed out that mixed inoculations Rhizobium + Bacillus megaterium + Glomus fasciculatum gave the highest nitrogen content of *Leucaena leucocephala* compared with controls.

Costa and **Paulino. (1990)** on *Leucaena leucocephala* found that inoculation with Rhizobium and/or the VAM fungus Acaulospora muricata increased total nitrogen content in the plant tissues. Also, **Costa *et al.* (1990)** reported that nitrogen content of pigeon pea plant increased with inoculated plants with dual Rhizobium / mycorrhizal. However, **Gupta *et al.* (1990)** found that dual inoculation with Rhizobium and Glomus fasciculatum increased nitrogen content of *Leucaena leucocephala* plant. In addition, **Sivaprasad** and **Rai (1991)** noticed that mixed inoculation (G. fasciculatum + Rhizobium) gave the highest rate of total nitrogen in tissue of *Leucaena leucocephala* plants.

Beniwal *et al.* (1992) mentioned that total nitrogen of *Acacia nilotica* was higher in dual-inoculated plants (Glomus mosseae + Rhizobium) than in plants inoculated with Rhizobium alone. Also, **Kaushik *et al.* (1993)** on *Cajanus cajan L.* Mill sp suggested that seedlings inoculated with Bradyrhizobium had greater total nitrogen percentage than control plants.

Tang (1994) observed that the highest total nitrogen of *Leucaena leucocephala* was obtained by using inoculation with Rhizobium strains IH-016 (Cuban) and IH-1020. While, **Toky *et al.* (1994)** noticed that the effect of Rhizobium in increasing nitrogen concentration in *Acacia nilotica* plants in the different nitrogen fertilizer treatments, as 0, 15, 30 or 60 p.p.m was highly significant. Also, **El-Sayed (2000)** found that mixed inoculation (Rhizobium + PDB) gave the highest trait of total nitrogen in crop legume followed by inoculation with Rhizobium only than the control treatment. In the same respect,

Benbrahim and **Ismaili (2002)** mentioned that Rhizobium inoculation alone significantly increased total N content of *Acacia saligna* plants.

Roomi ***et al.*** **(2002)** reported that *Acacia ampliceps* inoculated with Rhizobium strain TAL 569 produced the highest protein content (113%) as compared with TAL 1388, TAL 1881 and CB 3156. **Kamal (2003)** reported that highest nitrogen content of pigeon pea plants was obtained when using mixed inoculation Glomus fasciculatum+ Rhizobium as compared with the uninoculated plants. Also, **Rodrigues** ***et al.*** **(2003)** pointed out that mixed inoculation arbuscular mycorrhizal fungi (AMF and AMF)+ Rhizobium gave the highest rate of total nitrogen in tissue of *Sesbania virgata* plants. In another study, **Scotti** and **Correa (2004)** found that highest total nitrogen content of *Anadenanthera peregrina* plants was obtained by using mixed inoculation rhizobia (strain BHICB-A10) + arbuscular mycorrhizas as compared with uninoculated plants.

MATERIALS AND METHODS

This study was designed and implemented to investigate the response of two Prosopis species to spacing between plants and biofertilizer treatments on growth parameter, fodder production and its nutritive chemical constituents under the harsh adverse edaphic and environmental condition of wadi Sudr, S.Sinai.

Prosopis juliflora (Sw.) Dc. and *Prosopis chilensis (Mol.)* Stuntz were selected for this study because of their reasonable productivity under saline condition. Seeds of the two plant species were collected from Wadi Sudr in South Sinai.

Seeds were sown in polyethylene bags filled with sand and clay soil (1:1) in March, 2004 under the green-house conditions of the Desert Research Center. After complete emergence of seedlings, irrigation of beds was continued with tap water until transplantation, which was accomplished in September, 2004.

Field experiment was carried out on *Prosopis juliflora* and *Prosopis chilensis* at six months old transplants. Experiment was conducted in Ras Sudr Research Station, Desert Research Center, at South Sinai Governorate, Egypt during two successive growing years (2005 and 2006). The soil of the location was highly calcareous. Mechanical and chemical analysis of the experimental soil was conducted and presented in Table (1).

Soil analysis was carried out according to **Richards (1954), Black** and **Editor (1965)** and **Jackson (1967).**

The of experimental design was split split plot in three replicates, each replicate included 24 treatments which were the combination of two Prosopis species (*Prosopis juliflora* and *Prosopis chilensis)*, three plant spacing (2,3 and 4m) and four biofertilizer treatments (Control, Bradyrhizobium, Bradyrhizobium

+ Azospirillum and Bradyrhizobium + Azotobacter). The main plots were randomly devoted to species, while the sub-plots were assigned for the plant densities and the sub-sub plots were specificed to the biofertilizer treatments. The experimental treatments under the investigation were as follows:

A-Plant species:

Two plant species were used as follows:

1- *Prosopis juliflora* (Sw.) Dc.

2- *Prosopis chilensis* (Mol.) Stuntz.

B- Plant spacing:

Three plant spacing were used as follows:

1- 2 m between plants and 2m between rows.

2- 3 m between plants and 2m between rows.

3- 4 m between plants and 2m between rows.

C- Biofertilizer treatments:

A 250 ml Erlenmeyer flaska contianing 100 ml sterilized media were inoculated with one ml of Bradyrhizobium, Azospirillum and Azotobacter microbes, then shaked well on a rotary shaker (160 rpm) at 30 °C for 7 days.

Microbial cells were separately suspended into sterile water (containing 10^8 cells / ml). The mixed inoculum was prepared by mixing equal volumes of the desired cell suspensions.

Seeds of Prosopis species under study were successively washed and soaked in suspension of Bradyrhizobium individually or mixed as Bradyrhizobium +Azospirillum and Bradyrhizobium + Azotobacter 5% Carboxy methyl cellulose (CMC) for 30 minutes. Inoculation was conducted by using the inoculated coated seeds which were air dried for 2 h at 25-28 °C in shaded area. The uninoculated seeds treatments were soaked in the corresponding uninoculated medium at the same time to be used as a control.

Strains of *Bradyrizobium sp.*, *Azospirillum brasilense* and *Azotobacter chroococcum* were supplied from Microbiology unit, Desert Researsh Center (DRC) at El-Matariya.

The Four biofertilizer treatments under study were formulated as follows:

1- Control.

2- *Bradyrhizobium.*

3- *Bradyrhizobium* + *Azospirillum.*

4- *Bradyrhizobium* + *Azotobacter.*

Densities of plants for the studied Prosopis species were varied according to the number of plants per each experimental unit. Each experimental unit was (2 x 12 meter) 24 sq meter area where the desired plant distribution and densities per feddan were as follows:

Densities	No. of trees	Distance between Rows (m)	Distance between Plants (m)	plant densities per fed
Low.	3	2	4	525
Med.	4	2	3	700
High.	6	2	2	1050

The experiment site was irrigated immediately just after transplanting by saline water pumped from a well of 4500 ppm salinity, then irrigated each 7 days until end of the experiment. The analysis of irrigation-water is given in Table (1). Data of temperature, relative humidity and rainfall of the experimental site are shown in Table (2).

Table (1): **Mechanical, Chemical analysis of the experimental soil and irrigation water.**

A-Mechanical properties of the soil %.

Depth (cm)	Coarse sand (1 – 0.5)	Fine sand (0.25 – 0.1)	Total sand (0.1-1)	Silt (0.05 - 0.002)	Clay < (0.002)	Class texture
0-30	54.51	25.88	80.39	8.46	11.15	Sandy loam
30-60	25.49	61.12	86.61	7.14	6.25	Sandy loam

B-Chemical properties of the soil.

Depth (cm)	pH	Ec ds/m^2	Caco$_3$%	O.M %	Saturation soluble extract									
					Soluble anions (meq/L)				Soluble anions (meq/L)					
					Co^-_3	HCO^-_3	SO^-_4	Cl^-	Ca^{++}	Mg^{++}	Na^+	K^+	N	P
0-30	7.7	4.77	55.85	0.60	0.00	6.00	10.50	31.20	24.00	11.00	10.52	2.18	2.36	0.38
30-60	7.4	4.16	51.21	0.46	0.00	3.00	16.10	22.50	16.83	6.00	17.80	0.10	1.86	0.22

C-Chemical analysis of water for irrigation.

Well (ppm)	pH	Ec ds/m^2	Soluble anions (meq/L)				Soluble cations (meq/L)			
			Co^-_3	HCO^-_3	SO^-_4	Cl^-	Ca^{++}	Mg^{++}	Na^+	K^+
4500	8.6	7.03	0.00	2.50	16.22	81.28	23.65	19.18	65.66	0.51

The experiment received 150 kg calcium super phosphate / fed (15.5 % P_2O_5) and 20 m^3/feddan organic Form manure were applied throughly during soil preparation before transplanting.

Three plant were cut in a simulating browsing manner from each sub-sub plot from three replicates during spring and autumn from transplanting to evaluate the response the following characteristics:

A-Growth characteristics :

The studied growth parameters were recorded from randomly selected three plants in each experimental unit using the following procedures:-

1-Plant height (cm):

....It was measured from the soil surface up to the end of the growing tip of plants (*Prosopis juliflora* and *Prosopis chilensis*).

Table (2): Meteorological data of temperature, relative humidity and rainfall of Wadi Sudr in south Sinai.

Year	Month	Temp° C Mean.	R.H %	R.F (mm)
2004	September	26.47	66.63	0.00
	October	24.50	70.37	0.00
	November	20.17	63.26	0.00
	December	14.54	64.34	1.27
2005	January	14.40	64.65	4.51
	February	14.42	62.91	3.30
	March	17.15	61.41	2.02
	April	21.25	52.43	0.00
	May	25.99	49.77	0.00
	June	28.25	52.02	0.00
	July	29.52	56.04	0.00
	August	29.39	60.84	0.00
	September	27.08	61.44	0.00
	October	23.39	67.90	1.02
	November	19.84	70.18	0.25
	December	15.03	67.17	6.60
2006	January	14.76	62.84	7.32
	February	14.95	62.35	4.55
	March	16.89	59.54	3.06
	April	20.97	45.55	0.00
	May	24.61	49.74	0.00
	June	26.61	57.97	0.00
	July	31.44	53.33	0.00
	August	30.74	59.64	0.00
	September	26.98	60.32	0.00

2-Stem diameter (cm):

.... measured just before the branching point of shrub.

3-Number of branches / plant:

.... determined as an average of randomly selected three plants.

4- Height of the initiative branching point (cm):

.... measured from above soil surface to the branching point of the shrub.

5-Fresh and dry weight(g) / plant:

Branches and leaves of 3 randomly selected plants from each experimental unit (in a simulated browsing manner) were separated. Such separated leaves and branches were dried using an air forced drying oven at

70^{0} till constant weight. Then fresh and dry weight of leaves and branches were estimated in plant.

C-Chemical nutritive constituents:

Samples of the above dried leaves and branches were ground using a hummer mill of 4 mesh . Then kept in sealed plastic bags and stored in the refrigerator at (5°C) for chemical analysis whenever needed.

Chemical analysis included the following constituents:

1-Crude protein (CP) content:

....Total nitrogen was determined by modified microkjeldahl method according to **Peach** and **Tracey (1956)** and multiplied by 6.25.

2-Total carbohydrate(TC):

....determined according to the method outlined as described in **A.O.A.C. (1990)**.

3-Crude fiber (CF) content:

....determined by using the method described in **A.O.A.C. (1990)**.

4-Total ash content:

....determined as mentioned in the **A.O.A.C. (1990)**.

5-Digestible protein (DP) content:

....estimated from using the following formula:

DP % = 0.9596 CP % - 3.55 as documented by **Bredom *et al.* (1963)**.

6-Total digestible nutrients (TDN):

...estimated by using the following equations

TDN % =74.43 + 0.35 CP % - 0.73 CF % according to **Adams *et al.* (1964)**.

Statistical analysis:

Obtained data were subjected to the proper statistical analysis of variance for split split plot design according to the procedure outlined by **Snedecor** and **Cochran (1969).** Mean values of treatments were compared using L.S.D at 5% level as mentioned by **Steel** and **Torrie (1960).**

RESULTS AND DISCUSSION

Results will be presented and discussed in the following chronological order as follows:-

Results are presented and discussed on the effect of each of the applied individual factors (species, distances apart and biofertilizer treatments) over the other applied factors as well as their interaction.

Whereas, the recorded data for the interaction effect of any two factors are presented in the appendices and will be refered to whenever needed.

A-Vegetative parameters:

1-Height of plants

Data in Table (3, A1) represent the effect for each of the studied factors on plant hieght's of the two Prosopis species during spring and autumn seasons of the two growing years.

It was obviously clear that *Prosopis chilensis* (sp1) plants were taller than *Prosopis juliflora* (sp2) with significant differences in the two seasons of the two years with various magnitudes. The sp1 was taller in height than sp2 in spring, autumn of the first and the second growing year with 9.56, 14.99, 8.92 and 7.49 %, respectively.

Meanwhile, hieghts of plants were highly increased in spring of the second year than the first one which was 189.21 versus 63.37cm for *Prosopis chilensis*, being 173.71 versus 57.84 cm for *Prosopis juliflora*.

Such obtained results may confirm the unigue specification of plant height for each of the studied Prosopis species according to their specific genetical makeup that represent its identity in plant heights under the circumstances of the experiment.

Table (3): Effect of Prosopis species, planting distances and biofertilizer treatments on the height of plants (cm) during spring and autumn of the two growing years.

Seasons		2005		2006	
		Spring	**Autumn**	**Spring**	**Autumn**
SP	*P.chilensis (SP1)*	63.37	140.33	189.21	165.36
	P.juliflora (SP2)	57.84	122.04	173.71	153.84
L.S.D at 5%		2.15	8.66	1.03	2.58
D	**2 m (D 1)**	62.50	123.64	162.85	148.14
	3 m (D 2)	61.49	144.94	198.74	172.23
	4 m (D 3)	57.84	124.98	182.79	158.43
L.S.D at 5%		1.02	1.63	3.08	2.50
B	**Control (C)**	50.08	100.54	156.04	137.88
	Rhizobium (R)	60.57	130.24	177.48	154.35
	Rhiz.+Azos.(R+S)	63.63	143.69	189.82	165.43
	Rhiz.+Azot.(R+T)	68.15	150.28	202.51	180.75
L.S.D at 5%		0.90	1.65	1.70	2.02

Sp = Species **D** = Distances **B** = Biofertilizer.

Similar results were reported by other scientists where they noticed that *Prosopis flexuosa* plants were taller than *Prosopis alba* and *Prosopis glandulosa* (**Vilela** and **Ravetta 2000**); *Prosopis chilensis* and *Prosopis alba* plant were taller than *Prosopis velutina*, *Prosopis pubescens* and *Prosopis flexuosa* (**Vilela** and **Ravetta 2001**); and *Prosopis argentina* plants which were taller than *Prosopis alpataco* (**Villagraa** and **Cavagnarob 2006**).

Regarding the effect of distances between plants, results in Table (3) clearly indicated that increasing plant spacing from 2 to 3 and up to 4 m significantly affected plant heights of the two Prosopis species (*Prosopis chilensis* and *Prosopis juliflora*) in all of the studied growing periods. However, in spring of the first season, the narrowest distance (2 m) produced tallest plants (62.50cm) as compared with either of the wider distances 3 (61.49 cm) or 4 (57.84 cm) meter.

Meanwhile, the middle distance between plants (3 m) produced tallest plants as compared with 2 and /or 4 m between plants during the rest of the studied seasons which were 144.94, 198.74 and 172.23 cm during autumn of 2005, spring and autumn of 2006, respectively.

Similar results were reported by other scientists where they noticed that *Leucaena leucocephala* planted at 2x2 was taller than 1x1 m **(Dutt 1981)**; *Leucaena leucocephala* at 5 x 5 was taller than 3 x 3 m. **(Maghembe *et al.* 1986)**, *Cajanus cajan* at 60 cm was taller than 20 cm **(El-Hossini 1990)**, Giant saltbush at 3.0 m was taller than 1.5 m **(El-Deek *et al.* 1991)**, *Atriplex canescens* and *Acacia saligna* at 2 m was taller than 1 m **(Khalifa 1996)** and *Acacia mangium* was obtained with a low density **(Susumu *et al.* 2006)**.

On the other hand **Shashidhar *et al.* 1997; Shengzuo *et al.* 1999, Droppelmann** and **Berliner 2000, Goel** and **Behl 2004** and **Gopichnd *et al.* 2006** found that widening inter-plant spacing tended to decrease plant height under their experimental circumstances.

Concerning the effect of the applied biofertilizer treatments over species and distances between plants, it is generally noticed from Table (3) that any of the applied biofertilizer treatments exerted significant effect in increasing plant heights as compared with the control (without fertilization). This result was true for the two seasons (springs and autumns) of the two growing year (2005 and 2006) with variable magnitudes.

Moreover, it is obviously clear that the highest response of the applied biofertilizer treatments on stimulating taller growth of plants were for Rhizobium + Azotobacter then Rhizobium + Azospirillum followed by Rhizobium in a clear descending order. This trend was noticed for each of the studied two seasons of the two growing years in a variable magnitudes of significant difference. It is generally noticed the tallest plants were obtained during the second spring followed by the second autumn of the second growing year as it is clear from Table (3).

Almost, similar results regarding the response of biofertilizer treatments were reported by **Basu** and **Kabi (1987)** for *Prosopis juliflora*, **Pan** and **Cheng (1988)** for *Leucaena leucocephala* and **Beniwal *et al.* (1992)** for *Acacia nilotica* in respect to the effect of mixed Rhizobium + Azotobacter on the height of plants under study.

Moreover, such particular biofertilizer treatment (Rhizobium + Azotobacter) was of the atmost effect in increasing plant heights of Prosopis species compared with the other biofertilizer treatments (single or mixed) in their effect of stimulating plant height of several fodder shrubs were reported by other researchers **(Kamal, 2000; Abbas *et al*, 2001** and **Scotti** and **Correa, 2004)**.

Meanwhile, **Mohammad (1988)** noticed that triple inoculation with Rhizobium, Bacillus megaterium and Glomus fasciculatum increased seedling growth of *Leucaena leucocephala*, but Rhizobium alone was better than Bacillus megaterium and Glomus fasciculatum alone.

It is obviously clear that such treatment (Rhizobium + Azotobacter) was of the best significant effect in increasing plant height compared to the other mixed a (Rhizobium + Azospirillum) treatment.

From the interaction effect of the Prosopis species and the applied biofertilizer treatments on plant heights, it is clear from Table (4, A1) that tallest plants were generally noticed for *Prosopis chilensis* rather than for *Prosopis juliflora* when using both of the mixed biofertilizer treatments (Rhizobium + Azotobacter and Rhizobium + Azospirillum) as compared with Rhizobium alone and the control (without fertilizations) as well.

Such differences in plant heights were significant in the first spring and the second autumn of the first and second growing years.

Table (4) : Effect of the first order interactions on the height of Prosopis plants (cm) during spring and autumn of the two growing years.

Biofertilizer		2005		2006	
		Spring	Autumn	Spring	Autumn
Species x Biofertilizer					
Control	**Sp1**	54.93	109.93	163.03	140.13
	Sp2	45.23	91.14	149.05	135.63
Rhizobium	**Sp1**	62.18	139.55	185.41	162.14
	Sp2	58.97	120.94	169.55	146.56
Rhiz. + Azos.	**Sp1**	65.77	152.86	198.64	171.76
	Sp2	61.48	134.52	180.99	159.09
Rhiz. + Azot.	**Sp1**	70.62	158.99	209.76	187.41
	Sp2	65.68	141.57	195.26	174.09
L.S.D at 5%		1.27	N.S	N.S	2.86
Distances x Biofertilizer					
Control	**2 m**	50.76	94.01	144.74	127.79
	3 m	49.57	113.12	168.18	148.45
	4 m	49.92	94.48	155.21	137.40
Rhizobium	**2 m**	62.57	122.03	158.12	142.66
	3 m	62.07	144.24	195.80	167.14
	4 m	57.08	124.45	178.51	153.26
Rhiz. + Azos.	**2 m**	65.56	135.60	168.64	153.60
	3 m	65.01	158.57	208.24	178.82
	4 m	60.30	136.90	192.57	163.86
Rhiz. + Azot.	**2 m**	71.09	142.93	179.92	168.53
	3 m	69.31	163.83	222.73	194.52
	4 m	64.05	144.08	204.88	179.21
L.S.D at 5%		1.56	N.S	2.94	N.S
Species x Distances					
2 m	**Sp1**	63.18	130.30	167.44	153.47
	Sp2	61.82	116.98	158.27	142.82
3 m	**Sp1**	66.96	151.29	209.23	178.88
	Sp2	56.02	138.60	188.25	165.59
4 m	**Sp1**	59.99	139.41	190.96	163.74
	Sp2	55.68	110.55	174.62	153.12
L.S.D at 5%		1.47	2.35	4.44	N.S

Sp1=*Prosopis chilensis* **p2**=*Prosopis juliflora.* **D**=distance between plants
B =biofertilizer treatments.

Differences in plant heights could be ranked in the following descending orders as for the respective biofertilizer treatments: Rhizobium + Azotobacter, Rhizobium + Azospirillum, Rhizobium alone and the control with significantly higher magnitude for *Prosopis chilensis* than *Prosopis juliflora* during the first spring of the first growing year and the second autumn of the second year. Similar results were noticed in the second spring and the first autumn seasons with no significant differences.

In conclusion, tallest plants were noticed when using Rhizobium + Azotobacter biofertilizer treatment for *Prosopis chilensis* (187.41cm) and *Prosopis juliflora* (174.09 cm) in the second autumn season, corresponding to 70.62 and 65.68 cm in the first spring season.

Whereas, shortest plants were noticed for the unfertilized plants with significant higher magnitude for *Prosopis chilensis* than *Prosopis juliflora* during the corresponding previously mentioned seasons.

Such trend in plant heights was of highest magnitudes in the second spring season, followed by second autumn season, then the first autumn season followed by the first spring season (Table 4).

The interaction effect of planting spaces and biofertilizer treatments was significant on height of plants during the two spring seasons (Table 4). It is obviousd clear the mixed biofertilizer treatment (Rhizobium + Azotobacter) produced tallest plants of Prosopis species as compared with the other biofertilizer treatments (Rhizobium + Azospirillum, Rhizobium) and the control (without fertilizations). These results were only true in spring seasons.

Meanwhile, results indicated that with Rhizobium + Azotobacter biofertilizer treatment applied at 2 meter distance between plants produced the tallest Prosopis plants compared the other biofertilizer treatments (Rhizobium +

Azospirillum, Rhizobium) and the control as well. This reuslt was noticed during spring of the established year. However, such result was true when the distance between plants were 3 meter in the 2nd spring seasons.

It is generally noticed that each biofertilizer treatments produced taller plants at 3 meter distance between plants even for the control except for spring of the established year. However, the mixed biofertilizer treatments (Rhizobium + Azotobacter and Rhizobium + Azospirillum) produced significantly taller plants as compared to Rhizobium alone and the control.

It is well noticed that the second spring season of the second year was of greater magnitude in all of the studied parameters. This is more likely due to the substantial plant growth of the second year than the first establishment year.

The two applied mixed biofertilizer, Rhizobium + Azotobacter and Rhizobium + Azospirillum produced tallest plants in the subsequent spring seasons when planting was at 2 m apart, where plants were more taller in the later than the earlier biofertilizer treatments in the first spring. Similar results were recorded in spring of the second year with greater magnitude in the second than the first growing year (Table 4).

During the second spring season, taller plants were obtained at 3 m distance apart for any of the applied biofertilizer treatments where the tallest plants were significantly increased from the control (168.18 cm) to the Rhizobium (195.80 cm), then from the Rhizobium + Azospirillum (208.24 cm) and up to Rhizobium + Azotobacter (222.73cm) with significant differences. This slight variation in plant heights with its higher magnitudes in spring of the second year than of the first year is oftenly due to more proliferation of growth of the second year than the first one (Table 4) which is naturally well accept due to the substantial growth as age is proceeded.

The interaction effect of the grown two Prosopis species and spacing between plants on plant heights was significant in all seasons except for the second autumn of olmost similar trend (Table 4).

Results indicated that 3 meter distance between plants pr oduced tallest plants for *Prosopis chilensis* (66.96 cm) than *Prosopis juliflora* (56.02cm). Whereas, this trend was noticed at the medium (3 meter) distance between plants except during the first spring season where *Prosopis juliflora* were the tallest at 2 meter distance (61.82 cm) compared to either of the middle or the widest distance (3 or 4 meter).

Similar results regarding the interaction effect of species and distance between plants on the height of the grown plants were recorded by **Nimbkar *et al.* (1986)** on *Prosopis juliflora,* **El-Hossini (1990)** on *Cajanus cajan,* **Khalifa (1996)** on *Atriplex canescens* and *Acacia saligna*, **Vidal *et al.* (2000)** on *Prosopis juliflora* and **Susumu *et al.* (2006)** on *Acacia mangium.*

The interaction between for two Prosopis species, distances between plants and the applied biofertilizer treatments on the height of plants was significant during the two spring seasons and the second autumn season (Table 5, A1).

Tallest plants were noticed for *Prosopis chilensis* during spring season at 3 meter distances between plants (700 plant/fed), when fertilized with Rhizobium+Azotobacter which were 74.05 and 230.69 cm for the first and second spring seasons respectively, being 203.91cm in the second autumn season with significant differences.

Whereas, shortest plants were noticed for *Prosopis juliflora* at a distance of 3 meter between plants without biofertilizer application (control). This result was true during the first spring season. But in the second spring and autumn seasons the situation was slightly different where shortest plant were noticed for

Table (5) : Effect of the second order interactions on the height of Prosopis plants (cm) during spring and autumn of the two growing years.

	Bio.	D.	2005 Spring Sp1	2005 Spring Sp2	2005 Autumn Sp1	2005 Autumn Sp2	2006 Spring Sp1	2006 Spring Sp2	2006 Autumn Sp1	2006 Autumn Sp2
B*D*SP	Cont.	2 m	54.66	46.87	100.62	87.40	150.09	139.38	132.25	123.33
		3 m	58.53	40.61	120.59	105.65	178.51	157.86	148.06	148.83
		4 m	51.60	48.22	108.58	80.38	160.50	149.91	140.08	134.72
	Rhiz.	2 m	61.27	63.87	128.10	115.67	160.75	155.49	149.49	135.82
		3 m	66.39	57.75	152.11	136.37	209.22	182.38	177.24	157.04
		4 m	58.87	55.29	138.43	110.48	186.25	170.76	159.70	146.83
	Rhiz. + Azos.	2 m	65.55	56.58	141.88	129.32	174.22	163.06	159.14	148.05
		3 m	68.87	61.16	164.41	152.73	218.52	197.97	186.29	171.36
		4 m	62.91	57.70	152.29	121.51	203.18	1814.95	169.84	157.87
	Rhiz. + Azot.	2 m	71.24	70.95	150.61	135.25	184.70	175.14	172.97	164.08
		3 m	74.05	64.57	168.03	159.63	230.69	214.78	203.91	185.14
		4 m	66.56	61.53	158.33	129.83	213.90	195.86	185.35	173.07
L.S.D at 5%			2.20		N.S		4.16		4.95	

the same species (Sp2) at 2m distance between plants.

Such results may clarify the identity of Prosopis plant heights according to species, distance between plants and the applied biofertilizer treatments during spring and autumn seasons of the two growing years.

2- Stem diameter:

Over the grown species and the biofertilizer treatments results in Table (6, A2) showd the effect of each of the studied factors on stem diameters of the two grown Prosopis species. The *Prosopis chilensis* plants were of thicker stems as compared those of *Prosopis juliflora.* This result was true for each of the spring and autumn seasons of the two years with significant differences. The obtaind differences in stem diameter were 35.42, 3.86, 5.88 and 6.82% for spring, autumn of the first year ; spring and autumn of the second year respectively.

Meanwhile, it is well noticed that stem diameters were more thicker in the second year than the first one due to the expected substantial growth, whereas

Table (6) : Effect of Prosopis species, planting distances and biofertilizer treatments on stem diameter (cm) of plants during spring and autumn of the two growing years.

Seasons		2005		2006	
		Spring	Autumn	Spring	Autumn
SP	*P.chilensis (SP1)*	0.65	2.69	4.50	5.64
	P.juliflora (SP2)	0.48	2.59	4.25	5.28
L.S.D at 5%		0.07	0.05	0.07	0.03
D	**2 m (D 1)**	0.52	2.38	4.12	5.20
	3 m (D 2)	0.61	2.69	4.38	5.71
	4 m (D 3)	0.57	2.87	4.63	5.47
L.S.D at 5%		0.01	0.03	0.04	0.04
B	**Control (C)**	0.36	1.92	3.92	4.78
	Rhizobium (R)	0.54	2.40	4.28	5.40
	Rhiz.+Azos.(R+S)	0.62	2.96	4.55	5.67
	Rhiz. +Azot. (R+T)	0.75	3.30	4.76	5.99
L.S.D at 5%		0.02	0.04	0.04	0.04

Sp = Species **D** = Distances **B** =Biofertilizer.

the obtaind differences were more significant for *Prosopis chilensis* than *Prosopis juliflora.*

Similar differences were reported by **Villagraa** and **Cavagnarob (2006)** whom they found that *Prosopis argentina* was thicker in stems than *Prosopis alpataco.* Such obtaind results represent the genetical make-up identity for each of the studied Prosopis species in respect of their stem diameters.

Regarding the effect of planting distances between plants on stem diameter, it was significantly affected during each of the two seasons for the two years as presented in Table (6). Results indicated that during the first spring, distance of 3 m apart was responsible for producing the thickest stems (0.61cm). Over species and biofertilization treatments.

Distance of 3 meter apart (700 plant/fed) produced the thickest stem diameters of plants as compared with the other distances (2 and 4 meter) during first spring (0.61cm) and the second autumn (5.71cm) of the second year.

Whereas, the wider distance between plants of 4 meter (525 plant/fed) exerted significant effected on stem diameters of plants during the first autumn (2.87cm) and the second spring season (4.63 cm).These results may reflect the response of growth and its adaptation with age and the microenvironmental factors within plant canopies in respect of stem diameter. Among the researchers whom they found similar results were **Dutt (1981); Nimbkar *et al.* (1986), Douglas *et al.* (1990), El-Deek *et al.* (1991), Karim** and **Savill (1993), Alberto *et al.* (1998)** and **Goel** and **Behl (2004)**. Further study is needed in this concern..

Over the grown species and distance between plants, there was significant difference for diameter of plants receiving any of the applied biofertilizer treatments and the control as well (Table 6).

Mixed applied biofertilizers treatments (Rhizobium + Azospirillum or Rhizobium + Azotobacter), were significantly higher in their effect on stem diameter than Rhizobium treatment or the control. It is also clear that the biofertilizer application of Rhizobium + Azotobacter produced the thicker stem diameters (5.99 cm) which was significantly higher than the control, Rhizobium and Rhizobium + Azospirillum by 108.33, 38.89 and 20.97% in the first spring ; 21.43, 11.15 and 4.62% in the second spring ; being 71.88, 37.50 and 11.49% in the first autumn and 25.31,10.93 and 5.64% in the second autumn.

Similar results were reported by **Dutt** and **Urmila (1983); Badji *et al.* (1989), Verma *et al.* (1994), Jha (1999), Abbas *et al.* (2001)** and **Kamal (2003)**. Whereas, **Thapar *et al.* (1996)** noticed that *Acacia nilotica* inoculated with Rhizobium inoculation did not improve seedling growth, either alone or with vesicular-arbuscular mycorrhizal (VAM). Significant improvements in growth were noticed after inoculation in normal soil, with the VAM treatment alone.

It is clear from Table (7, A2) that the interaction effect between the applied biofertilizers and Prosopis species on their stem diameter was significant in all seasons except in autumn of the first year. The *Prosopis chilensis* was significantly thicker in its stem diameter than the *Prosopis juliflora* at any of the applied biofertilizer treatments and the control as well.

The mixed biofertilizer treatment (Rhizobium + Azotobacter) produced the thickest stems for *Prosopis chilensis* and *Prosopis juliflora* being thickest for the earlier than the later species. This result was significantly true for all seasons except during autumn of the first year. Meanwhile, the applied 3 biofertilizer treatments of Rhizobium + Azotobacter, Rhizobium + Azospirillum and Rhizobium were of the same descending order in response to stem thickness of two Prosopis species with greater magnitude for *Prosopis chilensis* than *Prosopis juliflora* (Table 7).

Regarding the interaction effect between the applied biofertilizer treatments and distance between plants on stem diameter of two Prosopis species was significant during all seasons under study.

Results indicated that 3 meter apart produced the thickest stem diameters of plants during spring-2005 and autumn-2006 when fertilized with Rhizobium + Azotobacter. Whereas, these results were obtained when planted at 4 meter during autumn-2005 and spring-2006 of the two Prosopis species.

The above results may clarify the beneficial effect of single or double biofertilizer treatments in respect of stem diameter of Prosopis species, moreover, the double mixed biofertilizer species were of more effect on stem diameter than single one.

Prosopis species and distances between plants interacted significantly on stem diameter of plants with significant differences during spring of the first year and autumn of the second year. Results indicated that 3 meter distance

Table (7) : Effect of the first order interactions on stem diameter (cm) of Prosopis plants during spring and autumn of the two growing years.

Biofertilizer		2005 Spring	2005 Autumn	2006 Spring	2006 Autumn
Species x Biofertilizer					
Control	Sp1	0.43	1.96	4.01	4.93
	Sp2	0.29	1.87	3.82	4.63
Rhizobium	Sp1	0.61	2.44	4.46	5.50
	Sp2	0.48	2.36	4.09	5.29
Rhiz. + Azos.	Sp1	0.70	3.03	4.68	5.88
	Sp2	0.55	2.90	4.43	5.46
Rhiz. + Azot.	Sp1	0.87	3.34	4.87	6.23
	Sp2	0.63	3.25	4.65	5.75
L.S.D at 5%		0.03	N.S	0.06	0.06
Distnnces x Biofertilizer					
Control	2 m	0.30	1.81	3.62	4.60
	3 m	0.42	1.92	3.90	4.97
	4 m	0.35	2.02	4.24	4.77
Rhizobium	2 m	0.46	2.25	4.01	5.06
	3 m	0.58	2.35	4.27	5.67
	4 m	0.60	2.61	4.55	5.46
Rhiz. + Azos.	2 m	0.60	2.58	4.31	5.40
	3 m	0.69	3.14	4.55	5.91
	4 m	0.59	3.18	4.80	5.70
Rhiz. + Azot.	2 m	0.72	2.86	4.54	5.72
	3 m	0.76	3.35	4.79	6.29
	4 m	0.76	3.68	4.95	5.97
L.S.D at 5%		0.04	0.04	0.07	0.07
Species x Distnnces					
2 m	Sp1	0.57	2.42	4.22	5.33
	Sp2	0.47	2.33	4.02	5.06
3 m	Sp1	0.74	2.73	4.51	5.91
	Sp2	0.48	2.64	4.24	5.50
4 m	Sp1	0.65	2.93	4.78	5.66
	Sp2	0.50	2.81	4.48	5.29
L.S.D at 5%		0.02	N.S	N.S	0.05

Sp1=*Prosopis chilensis* p2=*Prosopis juliflora.* D=distance between plants B =biofertilizer treatments.

(700 plant/fed) in between produced plants of thicker stems of *Prosopis chilensis* than *Prosopis juliflora* with significant differences during spring-2005 and autumn-2006 (Table 7).

The interaction effect of the applied treatments (Prosopis species, distances between plants and biofertilizer treatments) on the stem thickers of plants, are presented in Table (8, A2). Results generally indicated that the medium distance between plants (3 meter) for *Prosopis chilensis* received the mixed biofertilizer treatment (Rhizobium + Azotobacter) produced the thickest stems as compared when receiving the (Rhizobium + Azospirillum) followed by (Rhizobium) then by the control with significant differences during spring of the first year and autumn of the second year.

Table (8): Effect of the second order interactions on stem diameter (cm) of Prosopis plants during spring and autumn of the two growing years.

	Bio.	D.	2005				2006			
			Spring		Autumn		Spring		Autumn	
			Species				Species			
			Sp1	Sp2	Sp1	Sp2	Sp1	Sp2	Sp1	Sp2
B*D*SP	Cont.	2 m	0.33	0.27	1.85	1.78	3.67	3.57	4.74	4.47
		3 m	0.49	0.34	1.96	1.87	4.02	3.77	5.11	4.83
		4 m	0.46	0.24	2.08	1.95	4.34	4.13	4.93	4.61
	Rhiz.	2 m	0.50	0.42	2.28	2.21	4.15	3.87	5.10	5.02
		3 m	0.67	0.48	2.38	2.32	4.44	4.11	5.81	5.52
		4 m	0.66	0.53	2.67	2.55	4.79	4.30	5.59	5.33
	Rhiz. + Azos.	2 m	0.67	0.52	2.66	2.50	4.41	4.21	5.53	5.27
		3 m	0.84	0.53	3.21	3.06	4.68	4.42	6.21	5.62
		4 m	0.59	0.59	3.23	3.13	4.94	4.66	5.91	5.50
	Rhiz. + Azot.	2 m	0.77	0.67	2.90	2.82	4.66	4.42	5.96	5.48
		3 m	0.94	0.57	3.38	3.32	4.90	4.67	6.53	6.04
		4 m	0.89	0.64	3.73	3.62	5.05	4.85	6.21	5.72
L.S.D at 5%			0.05		N.S		N.S		0.10	

3- Height of the initiative branching point:

The response of the initiative branching points for the two Prosopis species were significantly varied during the two studied seasons of the two year Table (9, A3). Results indicated that *Prosopis chilensis* was of higher branching point

Table (9): Effect of Prosopis species, planting distances and biofertilizer treatments on height of the initiative branching point (cm) of plants during spring and autumn of the two growing years.

	Seasons	2005		2006	
		Spring	Autumn	Spring	Autumn
SP	*P.chilensis* (SP1)	5.20	14.66	18.93	19.61
	P.juliflora (SP2)	4.47	13.32	16.87	18.17
	L.S.D at 5%	0.38	0.06	0.08	0.11
D	2 m (D 1)	4.70	15.68	18.28	19.23
	3 m (D 2)	5.09	13.46	17.95	18.84
	4 m (D 3)	4.72	12.84	17.48	18.60
	L.S.D at 5%	0.21	0.06	0.05	0.02
B	Control (C)	3.40	13.18	17.44	18.45
	Rhizobium (R)	4.84	13.71	17.77	18.77
	Rhiz. +Azos.(R+S)	5.38	14.44	18.07	19.06
	Rhiz. + Azot.(R+T)	5.71	14.65	18.32	19.28
	L.S.D at 5%	0.30	0.06	0.04	0.03

Sp = Species **D** = Distances **B** =Biofertilizer.

as compared with *Prosopis juliflora* with various magnitudes within the different seasons.

It is also clear that the height of branching point in the two species was relatively higher in the second growing years as compared with the first year for either spring and autumn seasons. Meanwhile, the branching point was much taller in the second spring season (18.93 cm) as compared with same season of the first established year (5.20 cm). Such studied differences were 14.66 and 19.61cm in the first and second autumn seasons, respectively.

From the above results, it is likely true that the initial branching point of Prosopis species is controlled by the specific genetical component of the grown species.

Data in Table (9) showed that the highest branching point was for the narrowest planting distance (2 m) and substantially decreased with slight differences as the distance between plants increased from 2 m (1050 plant/fed) to 3 m (700 plant/fed) and up to 4 m (525 plant/fed).

These results were noticed for all of the studied seasons of the two years except during the first spring season of establishment were 3 m distance between plants produced the tallest branching point as compared with the narrowest (2 meter - 1050 plant/fed) and the widest (4 meter – 525 plant/fed) distance between plants with significant differences.

Such observed differences in the level of the initial branching point of plants during the first spring season as compared with the other seasons could be due to established circumstances and the slight relative variations within seedlings.

So, it could be generally concluded that higher branching points were noticed as the distance between plants decreased.

Data in Table (9) showed that any of the applied biofertilizer treatments significantly increased the height of branching points of plants as compared the control (without fertilizations). These results were true for each of the two studied seasons of the two growing years with significant differences of various magnitudes.

Results also showed significant variations in height of branching points of plants according to the applied biofertilizer treatments. It is obviously clear that either of the two mixed biofertilizer treatments (Rhizobium + Azotobacter and Rhizobium + Azospirillum) produced higher branching point than Rhizobium treatment alone.

Moreover, the mixed biofertilizer treatments Rhizobium + Azotobacter was of higher response in producing the highest branching point of plants as compared with the other mixed biofertilizer treatments (Rhizobium + Azospirillum) with significant differences.

It could be generally concluded that the substantially increase in branching point for the applied biofertilizer treatments could be ranked in an ascending order as follows: the control followed by Rhizobium, then Rhizobium + Azospirillum, followed by Rhizobium + Azotobacter. Such results were significantly noticed during the two seasons of each of the two years with different magnitudes.

Among seasons, the general response of branching point of plants was the most for the second autumn of the second year, followed by the second spring of the second year, then first autumn of the first year, followed by the first spring of the established year.

The interaction effect of the two Prosopis species and the applied biofertilizer treatments on the hight of branching points was significant in all seasons except during spring-2005 season. It is clear from Table (10, A3) that the highest of branching points were generally noticed for *Prosopis chilensis* rather than for *Prosopis juliflora* when fertilized with Rhizobium + Azotobacter followed by Rhizobium + Azospirillum then Rhizobium followed by the control (without fertilizations) in a descending order.

The mixed biofertilizer treatment (Rhizobium + Azotobacter) produced the highest of branching points for *Prosopis chilensis* (20.07 cm) and *Prosopis juliflora* (18.49 cm) being highest for the earlier than the later species. This result was significantly true for all seasons except during spring of the established year. Meanwhile, the applied 3 biofertilizer treatments of Rhizobium + Azotobacter, Rhizobium + Azospirillum and Rhizobium alone were of the same descending order in response to height of branching points of the two Prosopis species with greater magnitude for *Prosopis chilensis* than *Prosopis juliflora* (Table 10).

Table (10): Effect of the first order interactions on height of the initiative branching point (cm) of Prosopis plants during spring and autumn of the two growing years.

Biofertilizer		2005 Spring	2005 Autumn	2006 Spring	2006 Autumn
Species x Biofertilizer					
Control	Sp1	3.80	13.79	18.37	19.08
	Sp2	3.01	12.57	16.52	17.81
Rhizobium	Sp1	5.18	14.37	18.82	19.47
	Sp2	4.50	13.05	16.72	18.06
Rhiz. + Azos.	Sp1	5.71	15.15	19.13	19.83
	Sp2	5.05	13.73	17.01	18.29
Rhiz. + Azot.	Sp1	6.11	15.34	19.38	20.07
	Sp2	5.31	13.95	17.25	18.49
L.S.D at 5%		N.S	0.09	0.06	0.05
Distances x Biofertilizer					
Control	2 m	3.33	14.85	17.86	18.85
	3 m	3.64	12.54	17.54	18.37
	4 m	3.24	12.15	16.94	18.12
Rhizobium	2 m	4.71	15.40	18.16	19.11
	3 m	4.98	13.19	17.79	18.73
	4 m	4.83	12.54	17.36	18.47
Rhiz. + Azos.	2 m	5.24	16.14	18.42	19.39
	3 m	5.63	13.97	18.11	19.03
	4 m	5.26	13.21	17.68	18.76
Rhiz. + Azot.	2 m	5.51	16.33	18.67	19.55
	3 m	6.09	14.14	18.36	19.24
	4 m	5.54	13.46	17.92	19.05
L.S.D at 5%		N.S	0.11	0.07	0.06
Species x Distances					
2 m	Sp1	5.13	16.77	19.30	19.99
	Sp2	4.27	14.59	17.26	18.46
3 m	Sp1	5.83	13.80	18.95	19.50
	Sp2	4.35	13.12	16.95	18.18
4 m	Sp1	4.64	13.42	18.53	19.35
	Sp2	4.79	12.26	16.42	17.85
L.S.D at 5%		0.30	0.08	N.S	0.04

Sp1=*Prosopis chilensis* **p2**=*Prosopis juliflora*. **D**=distance between plants **B** =biofertilizer treatments.

The interaction effect of planting distance and biofertilizer treatments was significant on the height of branching points during all seasons except during spring-2005 season. The highest of branching points was obtained when Prosopis species were planted at 2 meter distance and fertilized with Rhizobium + Azotobacter during all seasons except during spring of the established year.

Prosopis species and distances between plants interacted significantly on height of branching points of two Prosopis species with significant differences during all seasons except during spring-2006.

Results in generally (Table 10) indicated that 2 meter distance between plants produced tallest branching points for *Prosopis chilensis* (19.99 cm) than *Prosopis juliflora* (18.46 cm). Whereas, this trend was noticed at the shorter (2 meter- 1050 plant/fed) distance between plants except during spring of the established year where *Prosopis chilensis* was of highest of branching points (19.50 cm) at 3 meter (700 plant/fed) distance between plants.

Data presented in Table (11, A3) showed that the interaction effect between Prosopis species, distance between plants and biofertilizer treatments was significant on the height of the initiative branching point during all of the studied seasons except the first established season of spring.

During autumn-2005, spring-2006 and autumn-2006, the highest length of branching was obtained for *Prosopis chilensis* when planted at 2 meters apart and inoculated with Rhizobium + Azotobacter. The respective height branching point were 17.30, 19.73 and 20.38 cm. Whereas the shortest length of branching point was recorded for *Prosopis juliflora* when planted at 4 meters apart without fertilization where the respective branching points were 11.60, 16.07 and 17.50 cm. The corresponding reductions in branching points were

Table (11): Effect of the second order interactions on height of the initiative branching point (cm) of Prosopis plants during spring and autumn of the two growing years.

	Bio.	D.	2005				2006			
			Spring		Autumn		Spring		Autumn	
			Species				Species			
			Sp1	Sp2	Sp1	Sp2	Sp1	Sp2	Sp1	Sp2
B*D*SP	Cont.	2 m	3.86	2.80	16.02	13.68	18.86	16.86	19.52	18.18
		3 m	4.29	2.98	12.66	12.42	18.45	16.62	18.98	17.77
		4 m	3.24	3.24	12.70	11.60	17.80	16.07	18.75	17.50
	Rhiz.	2 m	5.15	4.28	16.61	14.20	19.17	17.15	19.84	18.37
		3 m	5.65	4.31	13.42	12.95	18.79	16.79	19.34	18.13
		4 m	4.74	4.91	13.08	12.00	18.51	16.21	19.24	17.70
	Rhiz. + Azos.	2 m	5.61	4.88	17.14	15.13	19.43	17.40	20.21	18.57
		3 m	6.34	4.93	14.45	13.50	19.18	17.03	19.70	18.35
		4 m	5.17	5.35	13.85	12.57	18.77	16.59	19.57	17.96
	Rhiz. + Azot.	2 m	5.89	5.12	17.30	15.36	19.73	17.62	20.38	18.73
		3 m	7.02	5.16	14.69	13.59	19.37	17.34	20.00	18.47
		4 m	5.41	5.66	14.04	12.88	19.05	16.79	19.84	18.26
L.S.D at 5%			N.S		0.15		0.10		0.08	

49.14, 22.78 and 16.46 % between the earlier and the later interaction effect.

So, in conclusion. *Prosopis chilensis* was of the highest branching point when planted at 2 meters apart (20.38 cm) and fertilized with Rhizobium + Azotobacter.

Whereas, the shortes branching point was noticed for *Prosopis juliflora* when planted at 4 meters apart without fertilization. These results were true in all seasons except for the first established season.

4-Number of branches per plant:

Results in Table (12, A4) generally indicated that *Prosopis chilensis* was of more number branching as compared with *Prosopis juliflora*. This result was noticed for each of the two seasons of the two year with significant differences of various magnitudes.

Highest number of branches were noticed in the second spring season, followed by the second autumn season of the second year, then during the first autumn season followed by the spring established season of the first year, where

Table (12): Effect of Prosopis species, planting distances and biofertilizer treatments on number of branches / plant during spring and autumn of the two growing years.

	Seasons	2005		2006	
		Spring	Autumn	Spring	Autumn
SP	*P.chilensis* (SP1)	6.01	42.67	58.72	47.84
	P.juliflora (SP2)	5.68	38.62	53.79	44.55
	L.S.D at 5%	0.28	1.58	1.24	1.06
D	2 m (D 1)	5.21	31.96	50.78	42.54
	3 m (D 2)	6.15	47.22	61.08	49.80
	4 m (D 3)	6.18	42.76	56.92	46.25
	L.S.D at 5%	0.16	0.73	0.60	0.55
B	Control (C)	5.02	32.81	48.16	38.79
	Rhizobium (R)	5.52	38.37	54.18	43.59
	Rhiz.+Azos.(R+S)	6.03	43.63	59.22	49.24
	Rhiz. + Azot.(R+T)	6.81	47.78	63.46	53.16
	L.S.D at 5%	0.35	0.75	0.64	0.69

Sp = Species D = Distances B =Biofertilizer.

Prosopis chilensis was of more branching habit than *Prosopis juliflora* during all of the previously mentioned seasons. Similar results were obtained by **Goel** and **Behl (1995)**; **Harrisa *et al.* (2003), Vilela *et al.* (2003)** and **Villagraa** and **Cavagnarob (2006).**

Regarding response number of branches per plant to the applied planting distances over the applied biofertilizer treatments and species, it is well noticed that the medium distance (3 m – 700 plant/fed) produced the highest number of branches per plant as compared with the narrowest (2 m – 1050 plant/fed) or the widest distance (4 m – 525 plant/fed).

These results were noticed in all seasons except the first established spring season where 4 meter produced more number of branches per plant than 3 meter with slight insignificant differences during such established spring season with its common circumstances. Such effect was magnified in spring of the second season followed by autumn of the second year, than autumn of the established year. These results are in harmony with those of **Douglas *et al.* (1990); El-Hossini (1990), Susumu *et al.* (2006)** and **Bryla (2007).**

In conclusion, highest number of branches for Prosopis species were noticed when plantation was at 3 meter distance in between.

Over species and distances between plants, it is generally noticed from the data in Table (12) that any of the applied biofertilizer treatments exerted significant higher number of branches per plant as compared with the control (without fertilization).

This result was true for the two seasons (springs and autumns) of the two growing year (2005 and 2006) with variable magnitudes. It is obviously clear that the highest response of the applied biofertilizer treatments on enhancing branching behaviour of plants was for Rhizobium + Azotobacter, Rhizobium + Azospirillum followed by Rhizobium in a descending order. This trend was noticed for each of the studied two seasons of the two growing years in a significant manner of variable magnitudes.

It is generally noticed the highest number of branches per plant were obtained during the second spring followed by the second autumn of the second growing year. Many investigators found similar results among those were **Sivaprasad *et al.* (1983); Hendronomo (1984); Sivaprasad** and **Rai (1991), Barua (1994), El-Sayed (2000)** and **Kamal (2003).**

The interaction effect of Prosopis species and biofertilizer treatments did not exert appreciable significant response on number of branches per plant Table (13, A4).

Interaction effect of the applied biofertilizer treatments and distance between plants was significant during autumn 2005 only on number of branches per plant. Results in generally indicated that the highest number of branches per

Table (13) : Effect of the first order interactions on number of branches / plant of Prosopis plants during spring and autumn of the two growing years.

Biofertilizer		2005 Spring	2005 Autumn	2006 Spring	2006 Autumn
Species x Biofertilizer					
Control	Sp1	5.18	34.78	50.18	40.48
	Sp2	4.85	30.85	46.15	37.11
Rhizobium	Sp1	5.59	40.26	57.03	45.40
	Sp2	5.44	36.48	51.33	41.77
Rhiz. + Azos.	Sp1	6.15	45.85	61.81	50.89
	Sp2	5.92	41.41	56.63	47.59
Rhiz. + Azot.	Sp1	7.11	49.81	65.85	54.59
	Sp2	6.52	45.74	61.07	51.74
L.S.D at 5%		N.S	N.S	N.S	N.S
Distances x Biofertilizer					
Control	2 m	4.50	26.50	42.89	35.89
	3 m	5.33	37.83	53.11	41.78
	4 m	5.22	34.11	48.50	38.72
Rhizobium	2 m	4.89	30.44	48.11	40.16
	3 m	5.72	44.78	59.16	47.55
	4 m	5.94	39.89	55.28	43.05
Rhiz. + Azos.	2 m	5.33	33.05	54.17	45.05
	3 m	6.33	50.78	63.94	53.05
	4 m	6.44	47.05	59.55	49.61
Rhiz. + Azot.	2 m	6.11	37.83	57.94	49.05
	3 m	7.22	55.50	68.11	56.83
	4 m	7.11	50.00	64.33	53.61
L.S.D at 5%		N.S	1.36	N.S	N.S
Species x Distances					
2 m	Sp1	5.44	33.61	52.72	44.69
	Sp2	4.97	30.30	48.83	40.39
3 m	Sp1	6.64	49.08	63.78	50.91
	Sp2	5.66	45.36	58.39	48.69
4 m	Sp1	5.94	45.33	59.67	47.91
	Sp2	6.41	40.19	54.16	44.58
L.S.D at 5%		0.23	1.06	0.87	0.80

Sp1=*Prosopis chilensis* **p2**=*Prosopis juliflora*. **D**=distance between plants
B = biofertilizer treatments.

plant of the two Prosopis species were obtained when planted at 3 meter distance and fertilized with Rhizobium + Azotobacter during all seasons under study except during spring of the first established year.

However, the interaction effect of Prosopis species and distance between plants exerted significant differences in number of branches per plant during the spring and autumn seasons of the two years.

Results indicated that highest branching trend per plant was noticed when planting either *Prosopis chilensis* or *Prosopis juliflora* at 3 meter distance per plants as compared with the narrowest (2 m) or the widest distance (4 m) between plants. This result was significantly true for each of the studied seasons of the two years, with better branching behaviour for *Prosopis chilensis* than that of *Prosopis juliflora* with significant differences.

Also, it is well noticed the highest number of branches / plant was noticed during the second spring season, followed by the second autumn season, then the first autumn season, followed by spring season of the established year.Meanwhile, in all casses, *Prosopis chilensis* was of higher branching number than *Prosopis juliflora* with variable magnitudes within seasons, except during spring of the established year. The *Prosopis chilensis* surpassed *Prosopis juliflora* in branching number per plant when planted at 3 meter apart (700 plant/fed) in all seasons.

The interaction of each of the applied 3 factors on the number of branches per plant did not exert any significant differences on the number of branches per plant as indicated in the data presented in Table (14, A4). This result indicated that any and the applied factors acted individualy on such studied parameter.

5- weight / plant on fresh and dry matter basis :-

In comparing fresh and dry fodder weight / plant of the two grown Prosopis species, *Prosopis chilensis* was of the heaviest fodder production on fresh and

Table (14): Effect of the second order interactions on number of branches / plant of Prosopis plants during spring and autumn of the two growing years.

	Bio.	D.	2005				2006			
			Spring		Autumn		Spring		Autumn	
			Species				Species			
			Sp1	Sp2	Sp1	Sp2	Sp1	Sp2	Sp1	Sp2
B*D*SP	Cont.	2 m	4.77	4.22	27.78	25.22	44.11	41.66	37.44	34.33
		3 m	5.66	5.00	39.55	36.11	55.33	50.89	43.44	40.11
		4 m	5.11	5.33	37.00	31.22	51.11	45.89	40.55	36.89
	Rhiz.	2 m	5.11	4.66	32.33	28.55	49.89	46.33	42.77	37.55
		3 m	6.00	5.44	46.89	42.66	62.33	56.00	48.77	46.33
		4 m	5.66	6.22	41.55	38.22	58.89	51.66	44.66	41.44
	Rhiz. + Azos.	2 m	5.55	5.11	34.55	31.55	56.44	51.89	47.33	42.77
		3 m	6.78	5.89	53.44	48.11	66.78	61.11	53.66	52.44
		4 m	6.11	6.77	49.55	44.55	62.22	56.89	51.66	47.55
	Rhiz. + Azot.	2 m	6.33	5.89	39.78	35.89	60.44	55.44	51.22	46.89
		3 m	8.11	6.33	56.44	54.55	70.66	65.55	57.77	55.88
		4 m	6.89	7.33	53.22	46.78	66.44	62.22	54.77	52.44
L.S.D at 5%			N.S		N.S		N.S		N.S	

dry matter basis than for *Prosopis juliflora.* This result was true for each of the two studied seasons during the two grown seasons except for dry weight of second spring seasons where the difference did not reach the level of significant as it is clear from Table (15, A5 and A6).

Table (15): Effect of Prosopis species, planting distances and biofertilizer treatments on fresh and dry weight (g) / plant during spring and autumn of the two growing years.

Seasons		Fresh weight (g) / plant				Dry weight (g) / plant			
		2005		2006		2005		2006	
		Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
SP	*P.chilensis*	83.92	759.58	1130.99	1011.97	26.82	259.34	400.47	367.08
	P.juliflora	79.22	721.03	1079.43	979.96	25.23	246.39	380.25	356.02
L.S.D at 5%		2.53	14.17	9.45	10.91	0.24	2.75	N.S	10.06
D	2 m (D1)	74.54	682.36	1058.46	962.84	23.80	232.17	372.51	349.07
	3 m (D2)	85.31	792.06	1153.95	1031.03	27.20	271.13	409.02	373.39
	4 m (D3)	84.86	746.50	1103.22	994.03	27.07	255.30	389.55	362.20
L.S.D at 5%		1.49	5.54	6.86	9.48	0.33	1.41	N.S	8.22
B	Cont.	72.91	649.41	1011.40	919.74	22.94	216.32	353.57	326.78
	Rhiz.	79.27	721.30	1092.83	973.65	25.25	248.40	386.62	355.72
	R.+S.	85.36	771.79	1138.51	1019.73	27.28	264.98	403.30	372.16
	R.+T.	88.74	818.73	1178.10	1070.75	28.62	281.77	417.95	391.55
L.S.D at 5%		1.74	6.45	5.48	8.59	0.50	1.78	43.03	6.48

Meanwhile, it is well noticed that second spring or autumn season were of much higher production than either of their first seasons.

The obtained increase in fodder production of *Prosopis chilensis* than *Prosopis juliflora* was 5.93 and 4.78 % in the two successive spring seasons, being 5.35 and 3.27 % in the two successive autumn seasons on fresh matter basis. The corresponding increase in dry matter basis was 6.34 and 5.32 % in the two successive spring seasons, being 5.26 and 3.11% in the two successive autumn seasons on fresh matter basis.

Such results indicate the various identity for the weight plant each of the two Prosopis species under study in respect of their seasonal fodder production on fresh and dry matter basis. Similar results were reported by **Goel** and **Behl (1995)**; **Alejandro *et al.* (2000), Vilela** and **Ravetta (2001), Harrisa *et al.* (2003)** and **Villagraa** and **Cavagnarob (2006)**.

Fresh and dry fodder wei ght / plant was significantly increased as the distance between plants increased from 2 (1050 plant/fed) to 3 (700 plant/fed) meters. Such obtained results were noticed in all seasons. The obtained highest fresh fodder weight / plant was 14.45, 9.02, 16.08 and 7.08 %during the two subsequent spring and the two subsequent autumn seasons, respectively being 14.29, 9.80, 16.78 and 6.97 % for dry matter basis (Table 15).

Extnded the distance between plants from 3 to 4 meter caused a slight significant reduction in fresh and dry fodder weight per plant during all seasons except for dry weight of second spring season where the difference did not reach the level of significant as it is clear from Table (15).

The above results indicated that 3 meters between plants is more convenient for better growth and developments of plants under the prevaling environmental circumstances of the experiments. It is generally concluded that the obtained highest fresh and dry matter per plant was noticed at 3 meter apart between plants compared to 2 or 4 meter.

It appears to be true that narrower distance between plants (2 meter) will create competition for the essential biophysiological requirements for plants, meanwhile, extra widening the distance between plants (4 meters) could be a waste of natural resources due to the ineffecient use of soil, water solar radiation and the environmental hazards witch all affect the final output of production of weight/plant on fresh and dry matter basis. Similar results were reported by **El-Hossini (1990); El-Deek *et al.* (1991), Karim** and **Savill (1993), Khalifa (1996), Droppelmann** and **Berliner (2000)** and **Bignami *et al.* (2003).**

The applied biofertilizer treatments significantly affected both fresh and dry fodder weight / plant during the two studied seasons of the two years with variable magnitudes as recorded in Table (15). Results indicated that any of the applied biofertilizer treatments caused significant higher fresh and dry fodder weight /plant as compared with the control (without fertilizations).

Meanwhile, either of the two bio-mixed treatments (Rhizobium + Azotobacter and Rhizobium + Azospirillum) produced significantly higher fresh or dry fodder weight / plant than the single biofertilizer treatment (Rhizobium) and the control.

Data also showed that Rhizobium + Azotobacter biofertilizer treatment produced the highest fresh and dry fodder production / plant as compared with Rhizobium + Azospirillum treatment as well as the Rhizobium biofertilizer treatment and the control as well (Table 15).

In conclusion mixed biofertilizer treatments (Rhizobium + Azotobacter and Rhizobium + Azospirillum) surpassed the effect of the single treatments (Rhizobium) on fresh and dry matter basis of weight / plants. Similar results were reported by **Sivaprasad *et al.* (1983)** for *Leucaena leucocephala,* **Basu** and **Kabi (1987)** for *prosopis juliflora,* **Pan** and **Cheng (1988)** for *Leucaena leucocephala,* **Beniwal *et al.* (1992)** for *Acacia nilotica,* **Kamla *et al.* (1995)** for *Acacia nilotica,* **Kamal (2000)** for *Acacia nilotica,* **Banyal *et al.* (2001)** for *Acacia catechu* and *Acacia mollissima*and **Kamal (2003)** for *prosopis juliflora.*

The recorded data for the outstanding response of fresh and dry fodder weight / plant could insure the beneficial identities of exerting the effect of biofertilizers in its action of creating better soil conditions in respect of physical, chemical and microfloral status of the soil as well as elementating the environemental pollution and hazards when completely relying on chemical fertilizers.

Data in Table (16, A5 and A6) did not show significant interaction effect for any of the applied biofertilizer treatments and Prosopis species on weight of plants on either fresh or dry matter basis. This result was true in all of the studied seasons of the two years.

However, the interaction effect of the applied biofertilizer treatments and distance between plants was significant during autumn 2005 only on fresh and dry weight / plant. Highest fresh and dry weight / plant were obtained when Prosopis species were plant at 3 m distance and fertilized with Rhizobium + Azotobacter. The obtained fresh and dry weight / plant were 885.74 and 305.45 g/plant, respectivly during the first autumn season.

It looks to be tree that planting each of the two Prosopis species at 3 meter distance apart produced the leaviest weight / plant on fresh and dry matter basis during all of the studied seasons except the first established season with no significant differences, where such interaction effect was significant only during spring season on fresh and dry matter basis and during spring season of the second year only on fresh weight / plant (Table 16).

Table (16) : Effect of the first order interactions on fresh and dry weight (g) / plant of Prosopis plants during spring and autumn of the two growing years.

Bio.		Fresh weight(g)/plant				Dry weight(g)/plant			
		2005		2006		2005		2006	
		Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
Species x Biofertilizer									
Cont.	Sp1	75.88	666.90	1040.87	936.62	23.96	221.80	365.07	329.42
	Sp2	69.92	631.91	981.92	902.86	21.92	210.82	342.08	324.14
Rhiz.	Sp1	81.80	744.95	1120.17	992.25	26.10	256.09	397.08	363.83
	Sp2	76.76	697.64	1065.50	955.06	24.41	240.71	376.15	347.60
R. + S.	Sp1	87.54	791.22	1162.83	1035.33	28.04	271.74	412.96	378.03
	Sp2	83.18	752.37	1114.19	1004.12	26.53	258.22	393.66	366.29
R. + T.	Sp1	90.47	835.24	1200.06	1083.70	29.20	287.75	426.78	397.05
	Sp2	87.01	802.20	1156.13	1057.81	28.05	275.81	409.12	386.05
L.S.D at 5%		N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S
Distances x Biofertilizer									
Cont.	2 m	68.30	619.04	965.52	889.49	21.41	206.03	336.58	319.46
	3 m	75.66	684.06	1057.20	951.51	23.86	228.46	370.62	329.71
	4 m	74.76	645.13	1011.48	918.23	23.55	214.45	353.52	331.17
Rhiz.	2 m	72.28	665.22	1040.11	937.13	22.96	227.38	366.72	339.90
	3 m	82.99	768.38	1147.62	1009.85	26.44	264.81	407.55	371.90
	4 m	82.56	730.29	1090.78	973.98	26.37	253.02	385.57	355.35
R. + S.	2 m	77.03	704.85	1092.87	988.33	24.75	241.05	385.76	359.61
	3 m	89.70	830.06	1190.61	1055.14	28.59	285.81	423.26	385.62
	4 m	89.34	780.48	1132.06	1015.71	28.50	268.08	400.90	371.27
R. + T.	2 m	80.54	740.32	1135.36	1036.40	26.09	254.22	401.00	377.31
	3 m	92.91	885.74	1220.39	1107.65	29.92	305.45	434.65	406.32
	4 m	92.78	830.12	1178.55	1068.21	29.87	285.65	418.21	391.02
L.S.D at 5%		N.S	11.18	N.S	N.S	N.S	3.02	N.S	N.S
Species x Distances									
2 m	Sp1	76.80	699.01	1076.06	975.44	24.58	237.87	378.80	354.19
	Sp2	72.28	665.70	1040.87	950.24	23.03	226.48	366.23	343.95
3 m	Sp1	86.27	811.70	1187.07	1049.20	27.45	278.06	422.52	377.74
	Sp2	84.36	772.41	1120.83	1012.87	26.95	264.21	395.52	369.03
4 m	Sp1	88.71	768.02	1129.82	1011.27	28.44	262.11	400.10	369.32
	Sp2	81.01	724.99	1076.61	976.78	25.70	248.49	379.00	355.09
L.S.D at 5%		2.15	N.S	9.88	N.S	0.48	N.S	N.S	N.S

R+S = Rhizobium + Azospirillum

R+T = Rhizobium + Azotobacter

The interaction effect of the applied 3 factors (two Prosopis species, three distance between plants and four biofertilization treatments) did not show significant response on either fresh or dry weight / plant during all of the studied seasons of the two growing years as presented in Table (17, A5 and A6).

This result may indicate that each factor under study acted independantly on either fresh or dry weight / plant.

However, it is generally noticed that *Prosopis chilensis* was much higher in fresh and dry weight / plant than *Prosopis juliflora* especialy when planted at 3 meter distance apart using Rhizobium + Azotobacter biofertilizer treatments.These results were recorded in all seasons except during the first established season which is more likely reasonable due to the lack of time for growth and development for recently transplanted seedling.

B- Fresh and dry fodder yield :

Data in Table (18, A7 and A8) represent the effect of each of the applied factors (Prosopis species, distance between plants and biofertilization treatments) on the obtained fresh and dry fodder yield / fed of the two Prosopis species. Results showed the superiority of fresh and dry yield production of *Prosopis chilensis* as compared with *Prosopis juliflora* with significant differences in both of the successive spring and autumn seasons of the two growing years.

The increase in fresh fodder yield for *Prosopis chilensis* than *Prosopis juliflora* was 5.70, 4.56, 5.25 and 3.15 % in spring-2005, autumn-2005, spring-2006 and autumn-2006. The corrsponding dry fodder yield was 6.05, 5.01, 5.21 and 3.02 % fodder production per feddan with significant differences of variable magnitudes. Similar variations in fresh and dry yield productivity for the various Prosopis species were previously recorded by **Peter *et al.* (1989);**

Table (17): Effect of the second order interactions on fresh and dry weight (g) per plant of Prosopis plants during spring and autumn of the two growing years.

Bio.	D.	Fresh weight (g) /plant							
		2005				2006			
		Spring		Autumn		Spring		Autumn	
		Species				Species			
		Sp1	Sp2	Sp1	Sp2	Sp1	Sp2	Sp1	Sp2
Cont.	2 m	71.84	64.76	632.40	605.69	988.78	942.26	904.62	874.37
	3 m	77.91	73.41	703.32	664.80	1088.31	1026.08	968.39	934.62
	4 m	77.93	71.60	664.98	625.27	1045.54	977.41	936.86	899.59
Rhiz.	2 m	74.89	69.67	683.42	647.02	1055.57	1024.64	944.68	929.58
	3 m	83.45	82.52	794.32	742.44	1185.76	1109.46	1030.48	989.21
	4 m	87.05	78.06	757.11	703.47	1119.16	1062.41	1001.59	946.38
Rhiz. + Azos.	2 m	78.80	75.27	721.97	687.72	1111.61	1074.12	1004.37	972.30
	3 m	89.98	89.42	849.80	810.32	1220.73	1160.48	1072.43	1037.84
	4 m	93.82	84.85	801.88	759.06	1156.15	1107.97	1029.18	1002.24
Rhiz. + Azot.	2 m	81.66	79.42	758.26	722.38	1148.29	1122.42	1048.09	1024.71
	3 m	93.73	92.07	899.40	872.07	1253.49	1187.28	1125.51	1089.79
	4 m	96.02	89.54	848.08	812.17	1198.43	1158.67	1077.48	1058.93
L.S.D at 5%		N.S		N.S		N.S		N.S	
		Dry weight (g) /plant							
Cont.	2 m	22.64	20.20	210.32	201.74	344.47	328.68	326.48	312.44
	3 m	24.58	23.14	234.74	222.17	383.87	357.36	322.38	337.03
	4 m	24.66	22.42	220.35	208.55	366.85	340.19	339.39	322.94
Rhiz.	2 m	23.88	22.03	233.55	221.21	371.83	361.61	342.70	337.09
	3 m	26.48	26.38	274.33	255.29	422.62	392.49	382.99	360.82
	4 m	27.94	24.81	260.39	245.64	396.80	374.34	365.80	344.89
Rhiz. + Azos.	2 m	25.35	24.16	246.59	235.50	392.88	378.64	365.30	353.90
	3 m	28.61	28.56	292.85	278.77	435.73	410.78	392.13	379.11
	4 m	30.14	26.86	275.77	260.39	410.26	391.53	376.66	365.87
Rhiz. + Azot.	2 m	26.45	25.71	260.97	247.47	406.01	395.98	382.24	372.38
	3 m	30.11	29.72	310.31	300.59	447.85	421.44	413.47	399.17
	4 m	31.02	28.72	291.94	279.36	426.49	409.93	395.43	386.61
L.S.D at 5%		N.S		N.S		N.S		N.S	

B*D*SP

Table (18): Effect of Prosopis species, planting distances and biofertilizer treatments on fresh and dry fodder yield (kg/fed) during spring and autumn of the two growing years.

Seasons		Fresh yield (kg/fed)				Dry yield (kg/fed)			
		2005		2006		2005		2006	
		Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
SP	*P.chilensis*	62.53	568.46	851.32	763.19	19.99	194.00	301.19	276.74
	P.juliflora	59.16	540.10	814.24	739.86	18.85	184.40	286.79	268.63
L.S.D at 5%		2.74	4.13	15.31	16.45	0.08	10.22	2.44	6.79
D	2 m (D 1)	78.26	716.48	1111.40	1011.00	25.00	243.78	391.14	366.52
	3 m (D 2)	59.72	554.45	807.77	721.73	19.04	189.79	286.32	261.38
	4 m (D 3)	44.55	391.92	579.19	521.87	14.22	134.03	204.52	190.16
L.S.D at 5%		1.92	17.74	13.75	16.83	0.20	8.44	5.53	7.84
B	Control	54.64	489.18	761.62	694.03	17.19	162.95	266.15	246.70
	Rhiz.	59.11	539.92	822.70	734.08	18.82	185.65	290.92	267.93
	R.+ S.	63.53	576.96	858.42	769.87	20.33	197.97	303.94	280.81
	R.+T.	66.11	611.06	888.38	808.13	21.34	210.24	314.95	295.29
L.S.D at 5%		1.79	4.54	8.16	8.33	0.37	12.74	2.86	4.54

Sp = Species D = Distances B =Biofertilizer.

Duff ***et al.*** **(1994), Goel** and **Behl (1995), Vilela** and **Ravetta ((2000), Vilela** and **Ravetta (2001), Vilela** ***et al.*** **(2003)** and **Cariagaa** ***et al.*** **(2005).**

Such obtained differences in fresh and dry fodder yield among species and seasons could clarify the unique indentity for each of the two Prosopis species in their fresh and dry fodder productivity. These variable fresh and dry yield production is almost due to the specific genetical make-up and its interaction with the prevaling environmental and edaphic conditions of the plantation site (Ras Sudr, S.sinai).

Regarding the response of fresh and dry fodder production over the Prosopis species and the applied biofertilizer treatments (Table 18), it is very well noticed that as the distance between plants increased from 2 to 3 and up to 4 meter apart, fresh and dry fodder productivity substantially and significantly decreased per feddan during spring-2005, autumn-2005, spring-2006 and autumn-2006 season.

The respective highest fresh yield was 78.26, 716.48, 1111.40 and 1011.00 kg / fed for plantation of shortest distance between plants (2 meter-1050 plant/fed). The corresponding lowest fresh fodder yield was 44.55, 391.92, 579.19 and 521.87 kg/fed for the plantation at 4 meter (525 plant/fed) apart. Whereas, the medium planting distance (3 meter-700 plant/fed)) produce slightly lower fresh and dry fodder yield per feddan than 2 meter.

Similar results were reported by **Marchi *et al.* (1982); Maghembe *et al.* (1986), Karim** and **Savill (1993), Puri** *et al.* **(1994), Chandramala** *et al.* **(1996), Khalifa (1996), Alberto** *et al.* **(1998), Bignami** *et al.* **(2003)** and **Goel** and **Behl (2004).** So, it could concluded that the highest fresh and dry fodder yield over Prosopis species and biofertilizer treatments was 2 meter apart between plants which contain 1050 plant / fed.

Regarding the effect applied biofertilizer treatments on fresh and dry fodder yield of Prosopis species, it is obviously clear that any of the applied biofertilizer treatments exerted significant increase in fresh and dry yield as compared with the control (without fertilizations). Moreover, there was significant differences in fresh and dry fodder yield between each of the 3 applied biofertilizer treatments. Highest fresh and dry fodder yield was obtained when using the mixed biofertilizer treatment of (Rhizobium + Azotobacter) which was significantly higher than the other mixed treatment (Rhizobium + Azospirillum).

Whereas, each of the two mixed biofertilizer treatments (Rhizobium + Azotobacter or Rhizobium + Azospirillum) produced significantly higher yield than the single biofertilizer treatment of Rhizobium. The increase in fresh fodder yield for Rhizobium + Azotobacter compared to the control was 20.99, 16.64, 24.92 and 16.44% during spring-2005, spring-2006, autumn 2005 and autumn 2006 seasons respectivly, for fresh fodder yield; being 24.14, 18.34, 29.03 and 19.70 % for dry fodder yield. Similar results were reported by **Chao** and **Young (1985); Tang (1985), Jain *et al.* (1988), Costa *et al.* (1990), Thapar *et al.***

(1996), Sujan and **Singh (1997), Devanand *et al.* (2002)** and **Rodrigues *et al.* (2003)**.

As it is clear in Table (19, A7 and A8), the interaction effect of Prosopis species and the applied biofertilizer treatments on fresh or dry fodder yield, was not significant in all seasons except for autumn 2005 season on fresh yield where *Prosopis chilensis* was of higher fresh and dry fodder yield than *Prosopis juliflora* for any of the applied biofertilizer treatments and the control as well.

The descending superiority of such treatments was for Rhizobium + Azotobacter, Rhizobium + Azospirillum, Rhizobium and the control, (Table 19, A7 and A8).

Over, the two Prosopis species, the interaction effect of distance between plants and the biofertilizer treatments on fresh and dry fodder yield was significant in all seasons except during newly established in spring-2005 for fresh yield and during autumn-2005 for dry yield.

Results indicated that 2 meter distance was the best in fresh and dry fodder yield production of Prosopis species when fertilized with Rhizobium + Azotobacter, followed by Rhizobium + Azospirillum, then Rhizobium followed by the control (Table 19).

Meanwhile, the interaction effect of Prosopis species and distance between plants on fresh and dry fodder yield was not significant during all seasons except for spring-2005 on fresh and dry matter yield, where *Prosopis chilensis* was superior than *Prosopis juliflora* for fresh and dry matter production at any of the grown distances between plants (2, 3 and 4 meter).

However, the highest fresh and dry fodder yield was obtained at 2 meter (1050 plant / fed) distance between plants followed by 3 meter (700 plant / fed) then 4 meter (525 plant / fed) apart (Table 19).

Table (19): Effect of the first order interactions on fresh and dry yield (kg/fed) of Prosopis plants during spring and autumn of the two growing years.

Bio.		Fresh yield(kg/fed)				Dry yield(kg/fed)			
		2005		2006		2005		2006	
		Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
Species x Biofertilizer									
Cont.	Sp1	56.96	501.81	782.98	706.52	17.98	166.95	274.34	248.88
	Sp2	52.32	476.53	740.25	681.54	16.40	158.95	257.95	244.51
Rhiz.	Sp1	60.92	557.04	841.98	746.36	19.42	191.33	298.19	273.32
	Sp2	57.30	522.80	803.42	721.79	18.21	179.98	283.66	262.53
R. + S.	Sp1	64.99	591.31	876.22	781.88	20.82	202.90	310.98	285.27
	Sp2	62.06	562.61	840.62	757.86	19.82	193.04	296.90	276.39
R. + T.	Sp1	67.25	623.67	904.10	818.01	21.71	214.84	321.23	299.47
	Sp2	64.95	598.45	872.65	798.25	20.96	205.64	308.67	291.13
L.S.D at 5%		N.S	6.42	N.S	N.S	N.S	N.S	N.S	N.S
Distances x Biofertilizer									
Cont.	2 m	71.70	649.99	1013.79	933.97	22.49	216.34	353.41	335.44
	3 m	52.97	478.84	740.04	666.06	16.71	159.93	259.44	230.80
	4 m	39.25	338.70	531.03	482.07	12.37	112.58	185.60	173.86
Rhiz.	2 m	75.90	698.48	1092.11	983.98	24.10	238.76	385.05	356.89
	3 m	58.09	537.87	803.33	706.90	18.50	185.37	285.29	260.33
	4 m	43.35	383.41	572.66	511.35	13.85	132.84	202.43	186.56
R. + S.	2 m	80.89	740.09	1147.51	1037.76	25.99	253.10	405.06	377.59
	3 m	62.80	581.05	833.42	738.60	20.01	200.06	296.29	269.94
	4 m	46.90	409.75	594.34	533.25	14.97	140.75	210.48	194.92
R. + T.	2 m	84.57	777.33	1192.12	1088.22	27.39	266.94	421.05	396.18
	3 m	65.04	620.02	854.28	775.36	20.94	213.82	304.25	284.42
	4 m	48.71	435.82	618.74	560.81	15.69	149.96	219.56	205.29
L.S.D at 5%		N.S	7.87	14.14	14.44	0.64	N.S	4.94	7.87
Species x Distances									
2 m	Sp1	80.64	733.96	1129.86	1024.22	25.81	249.76	397.74	371.89
	Sp2	75.89	698.99	1092.91	997.75	24.17	237.80	384.54	361.16
3 m	Sp1	60.39	568.20	830.95	734.45	19.21	194.65	295.77	264.42
	Sp2	59.06	540.69	784.58	709.01	18.87	184.95	276.87	258.32
4 m	Sp1	46.57	403.21	593.15	530.92	14.93	137.61	210.06	193.90
	Sp2	42.53	380.62	565.22	512.81	13.50	130.46	198.97	186.42
L.S.D at 5%		2.77	N.S	N.S	N.S	0.29	N.S	N.S	N.S

The interaction effect of the applied 3 factors (Prosopis species, distance between plants and biofertilization treatments) on either fresh or dry fodder yield was not significant in all seasons of the two growing years. This result indicated that each of the applied factors affected fresh and dry fodder yield of each of the Prosopis species independently Table (20, A7 and A8).

The extra increase in growth and yield parameters of Prosopis species during spring and autumn seasons of the second year (2006) as compared with the previous year (2005) may be due to the increase in rainfall rate and the reduction of temperature as well.

C- Chemical constituents:

Results of the chemical analysis for leaves and branches of Prosopis species as affected by the applied factors and their interactions will be presented and discussed for their individual factor and their interactions. However, data of interaction effect of each two factors will be only presented for further investigation if needed. Such trend in results is adopted for betters and easier understanding as well as for avoiding the redundant purpose of the effect of the individual parameters and their over all interaction on the chemical compenents of leaves and branches of the Prosopis species in each of the two seasons of the two growing years.

Chemical constituents as affected by any of the individial factors (over the other factors) and their interaction effect of Prosopis leaves and branches will be presented and discussed as follows :-

It is generally noticed from the recorded data in Table (21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31 and 32) that the applied studied factors did not show vast differences in most of the determined chemical components where the range of most of the studied components is more or less narrow.

In spite of the recorded narrowest ranges of the chemical constituents, Table (20): Effect of the second order interactions on fresh and dry fodder yield (kg/fed) of Prosopis plants during spring and autumn of the two growing years.

B*D*SP

Bio.	D.	2005 Spring Sp1	2005 Spring Sp2	2005 Autumn Sp1	2005 Autumn Sp2	2006 Spring Sp1	2006 Spring Sp2	2006 Autumn Sp1	2006 Autumn Sp2
Fresh yield(kg/fed)									
Cont.	2 m	75.42	67.98	664.02	635.97	1038.22	989.37	949.85	918.09
	3 m	54.53	51.40	492.32	465.36	761.82	718.26	677.88	654.23
	4 m	40.91	37.58	349.12	328.26	548.90	513.14	491.85	472.29
Rhiz.	2 m	78.63	73.16	717.59	679.37	1108.35	1075.88	991.91	976.06
	3 m	58.41	57.77	556.03	519.71	830.03	776.63	721.34	692.46
	4 m	45.70	40.98	397.49	369.32	587.55	557.76	525.83	496.85
Rhiz. + Azos.	2 m	82.74	79.03	758.08	722.11	1167.19	1127.83	1054.60	1020.91
	3 m	63.00	62.60	594.86	567.23	854.52	812.34	750.71	726.49
	4 m	49.25	44.54	420.99	398.51	606.97	581.69	540.32	526.17
Rhiz. + Azot.	2 m	85.74	83.39	796.17	758.49	1205.70	1178.55	1100.50	1075.95
	3 m	65.62	64.46	629.59	610.46	877.44	831.10	787.86	762.86
	4 m	50.41	47.01	445.24	426.39	629.17	608.30	565.67	555.94
L.S.D at 5%		N.S		N.S		N.S		N.S	
Dry yield(kg/fed)									
Cont.	2 m	23.77	21.21	220.84	211.83	361.69	345.11	342.81	328.06
	3 m	17.21	16.20	164.32	155.52	268.71	250.16	225.67	235.93
	4 m	12.95	11.78	115.67	109.49	192.60	178.60	178.18	169.54
Rhiz.	2 m	25.08	23.14	245.24	232.27	390.42	379.69	359.84	353.94
	3 m	18.54	18.47	192.03	178.70	295.83	274.74	268.09	252.57
	4 m	14.67	13.03	136.71	128.96	208.32	196.53	192.05	181.07
Rhiz. + Azos.	2 m	26.62	25.37	258.93	247.27	412.53	397.57	383.58	371.60
	3 m	20.03	20.00	205.00	195.14	305.01	287.56	274.50	265.39
	4 m	15.83	14.11	144.78	136.71	215.39	205.56	197.75	192.08
Rhiz. + Azot.	2 m	27.77	27.00	274.03	259.84	426.31	415.78	401.36	391.00
	3 m	21.08	20.80	217.22	210.41	313.50	295.01	289.43	279.42
	4 m	16.28	15.08	153.26	146.66	223.91	215.21	207.60	202.97
L.S.D at 5%		N.S		N.S		N.S		N.S	

a slight behavior trend could be detected for several chemical constituents as affected by some of the applied factors.

Such observation will be presented and disscussed as follows :-

1-Crud protein content (CP) :

Data in Table (21, A9 and A10) regarding leaves of Prosopis species as affected by the applied factors, it is well noticed that *Prosopis chilensis* was slightly significant in possessing higher CP content than *Prosopis juliflora.* This result was observed in each of the two spring and autumn seasons of the two growing years with slight variable magnitudes.

Similar trend was recorded for CP content of their branches with slightly higher magnitudes for leaves rather than branches with around 2.5- 4% CP higher in *Prosopis chilensis* than *Prosopis juliflora.* Such results were slightly significant in all seasons except for first spring of the established year. Similar results were reported by **Vilela** and **Ravetta (2000); Gabriele *et al.* (2001), Jorge *et al.* (2001), Vilela** and **Ravetta (2001), Deans *et al.* (2003)** and **Vilela *et al.* (2003)** on CP content of Prosopis species during various growing seasons.

Distance between plants showed slight significant effect on the CP content for either leaves or branches (over species and biofertilizer treatments) as it is clear in Table (21). The C P content was the slightly higher in leaves than branches with significant differences.

As the distance between plants increased from 2 to 3 meters apart caused slight significant increase in C P content of leaves and branches. However, extra increase in distance between plants (4 meter apart) slightly decreased C P content of leaves and branches of the two Prosopis species. This result was noticed for all seasons except during the first spring of the first established year.

Table (21): Effect of Prosopis species, planting distances and Biofertilizer treatments on crude protein % of leaves and Branches during spring and autumn of the two growing years.

Seasons		CP % of Leaves				CP % of Branches			
		2005		2006		2005		2006	
		Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
SP	*P.chilensis*	14.31	15.28	14.74	14.50	11.26	12.88	12.68	12.00
	P.juliflora	13.97	15.16	14.63	14.22	11.00	12.50	12.35	11.78
L.S.D at 5%		0.20	0.08	0.02	0.10	N.S	0.05	0.10	0.03
D	**2 m (D 1)**	13.89	15.08	14.39	14.08	10.82	12.45	12.28	11.68
	3 m (D 2)	14.23	15.38	14.92	14.55	11.27	12.89	12.72	12.12
	4 m (D 3)	14.30	15.21	14.76	14.45	11.30	12.73	12.54	11.88
L.S.D at 5%		0.07	0.03	0.01	0.08	0.12	0.05	0.09	0.03
B	**Control**	13.47	14.79	14.41	13.72	10.49	12.31	12.13	11.56
	Rhiz.	14.02	15.18	14.58	14.28	10.96	12.60	12.48	11.80
	R.+ S.	14.36	15.39	14.79	14.58	11.40	12.83	12.61	12.02
	R.+ T.	14.71	15.52	14.96	14.87	11.67	13.02	12.84	12.18
L.S.D at 5%		0.10	0.04	0.01	0.08	0.12	0.03	0.09	0.02

Sp = Species D = Distances **B** =Biofertilizer.

So, it could be concluded that 3 meter distance between plants (700 plant / fed) was much better for producing slightly higher C P content in leaves and branches of the two Prosopis species as compared with the narrower or the wider distances of 3 or 4 meters apart. It look to be true that such distance is the best for growth, development and accumulation of CP content under the circumstances of this experiment. This finding is in agreement with those obtained by **El-Hossini (1990); Sunil *et al.* (1993)** and **Chandramala *et al.* (1996).** On the contrary **Ahlawat** and **Saraf (1981), Maghembe *et al.* (1986)** and **Khalifa (1996)** whom they found that narrowest spacing gave higher protein percentage as compared with shrubs cultivated on widest spacing.

Data in Table (21) clarified higher CP content in leaves than branches of Prosopis species during all seasons of the two growing years under all of the applied distances between plants.

The applied biofertilizer treatments caused slight significant differences on C P content of leaves and branches of the two Prosopis species in all seasons of the two growing years as shown in Table (21).

Any of the applied biofertilizer treatments either single or mixed produced slightly significant increase in C P content of each of the two Prosopis species either in their leaves or branches as compared with the control (without fertilizations). These results were noticed in all seasons of the two growing years.

Among the applied three biofertilizer treatments, Rhizobium + Azospirillum and Rhizobium + Azotobacter produced slightly higher C P contain in leaves and branches over the two Prosopis species in their leaves and branches as compared with the single biofertilizer treatment (Rhizobium). Whereas, the last mixed biofertilzer treatment (Rhizobium + Azotobacter) was more effective in producing higher C P content than the other mixed treatment (Rhizobium + Azospirillum).

In conclusion Rhizobium + Azotobacter was better than Rhizobium + Azospirillum which in turn better than the single biofertilizer treatment of Rhizobium with slight significant diffrences where the control plants contained the lowest C P content in their leaves and branches with slight significant diffrences than any of the previously mentioned biofertilizer treatment. Such results were true in all of the studied seasons of the two years.

Data in Table (22, A9 and A10) represent the interaction effect of the applied 3 factors (Prosopis species x distance between plants x biofertilization treatments) on CP content of leaves and branches of each the two Prosopis species in the different seasons of the two growing years was significant during spring-2006 for leaves and during the two autumn-2005/2006 seasons for branches.

Table (22): Effect of the second order interactions on crude protein % of leaves and branches of Prosopis plants during spring and autumn of the two growing years.

B*D*SP

Bio.	D.	CP % of Leaves							
		2005				2006			
		Spring		Autumn		Spring		Autumn	
		Species				Species			
		Sp1	Sp2	Sp1	Sp2	Sp1	Sp2	Sp1	Sp2
Cont.	2 m	13.42	13.11	14.68	14.61	14.11	14.06	13.66	13.24
	3 m	13.88	13.27	15.04	14.85	14.73	14.57	14.18	13.77
	4 m	13.58	13.55	14.81	14.72	14.59	14.40	13.86	13.59
Rhiz.	2 m	13.94	13.48	15.12	14.89	14.24	14.32	14.19	13.78
	3 m	14.42	13.79	15.43	15.26	14.89	14.77	14.54	14.36
	4 m	14.34	14.19	15.25	15.16	14.78	14.49	14.48	14.30
Rhiz. + Azos.	2 m	14.34	13.85	15.31	15.22	14.40	14.59	14.48	14.06
	3 m	14.71	14.14	15.60	15.44	15.08	14.95	14.83	14.64
	4 m	14.60	14.50	15.43	15.35	15.06	14.68	14.85	14.60
Rhiz. + Azot.	2 m	14.60	14.38	15.43	15.33	14.56	14.81	14.77	14.45
	3 m	15.01	14.59	15.75	15.66	15.23	15.10	15.12	14.95
	4 m	14.85	14.80	15.53	15.43	15.18	14.86	15.01	14.90
L.S.D at 5%		N.S		N.S		0.02		N.S	
		CP % of Branches							
Cont.	2 m	10.23	10.13	12.29	11.87	12.13	11.71	11.50	11.26
	3 m	10.93	10.34	12.72	12.19	12.53	12.06	11.91	11.65
	4 m	10.67	10.61	12.77	12.00	12.44	11.93	11.62	11.44
Rhiz.	2 m	10.78	10.39	12.48	12.29	12.31	12.19	11.68	11.50
	3 m	11.39	10.81	12.91	12.72	12.90	12.56	12.18	11.87
	4 m	11.26	11.13	12.78	12.39	12.65	12.27	11.87	11.71
Rhiz. + Azos.	2 m	11.17	11.01	12.64	12.48	12.47	12.31	11.86	11.70
	3 m	11.77	11.34	13.28	12.86	12.84	12.67	12.39	12.14
	4 m	11.52	11.60	13.09	12.65	12.88	12.40	12.14	11.90
Rhiz. + Azot.	2 m	11.54	11.31	12.89	12.69	12.65	12.47	12.07	11.84
	3 m	12.02	11.53	13.45	13.00	13.32	12.89	12.50	12.27
	4 m	11.85	11.75	13.27	12.84	13.05	12.67	12.28	12.12
L.S.D at 5%		N.S		0.07		N.S		0.05	

It well noticed in general that highest CP content was obtained for *Prosopis chilensis* leaves and branches when planted at 3 meter distance apart (700 plant/fed) and fertilized with the mixed biofertilizer treatment Rhizobium + Azotobacter. Whereas, the lowest CP content was recorded for *Prosopis juliflora* leaves and branches when planted at 2 meter apart (1050 plant/fed) without fertilization. However, in all cases leaves contained more CP than branches for the two species in almost all seasons of the two years.

Results may clarify the differences in Prosopis species, distance between plants and biofertilization treatments the prevailing environmental factors and time intervals on the CP content of leaves and branches.

2-Crud fiber content (CF) :-

The CF content of leaves and branches of Prosopis species as affected by the applied factors are presented in Table (23, A11 and A12). It is noticed that *Prosopis juliflora* was slightly significant in possessing higher CF content than *Prosopis chilensis* . These results were observed during the two studied seasons of the two years with slightly higher magnitudes for leaves rather than branches.

Such results were slightly significant in all season except during spring of the established year. These results are in harmony with those of **Vilela *et al.* (2003)** whom they noticed that *Prosopis alba* > *Prosopis flexuosa* and *Prosopis strombulifera* in their crude fiber content.

Results in Table (23) indicated that distance between Prosopis plants showed slight significant effect with no specific trend on the C F content for their leaves and branches being higher in branches than leaves in all seasons and at any distance between plants.

The CF content did not show different behaviour either in leaves or branches of Prosopis species, since CF values were fluctuated according to the

Table (23): Effect of Prosopis species, planting distances and Biofertilizer treatments on crude fiber % of leaves and branches during spring and autumn of the two growing years.

Seasons		CF % of Leaves				CF % of Branches			
		2005		2006		2005		2006	
		Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
SP	*SP1*	21.85	24.73	25.24	25.72	28.01	30.96	31.28	32.11
	SP2	23.51	25.09	25.57	26.15	28.42	31.28	31.60	32.44
L.S.D at 5%		1.32	0.08	0.07	0.21	0.09	0.12	0.02	0.07
D	2 m	22.02	24.92	25.57	26.14	27.95	31.15	31.57	32.44
	3 m	22.65	24.72	25.19	25.73	28.19	30.85	31.27	32.08
	4 m	23.37	25.08	25.44	25.92	28.49	31.35	31.47	32.30
L.S.D at 5%		0.86	0.03	0.03	0.04	0.22	0.04	0.05	0.02
B	C.	23.36	25.38	25.74	26.18	28.98	31.42	31.68	32.64
	R.	22.80	25.14	25.56	26.01	28.46	31.23	31.54	32.43
	R+S	22.53	24.71	25.32	25.85	27.87	31.01	31.38	32.16
	R+T	22.03	24.40	24.99	25.69	27.54	30.79	31.15	31.86
L.S.D at 5%		0.76	0.04	0.05	0.02	0.25	0.03	0.03	0.03

Sp = Species D = Distances **B** =Biofertilizer.

various distances between plants. This trend was clear over the four seasons of the two years for either leaves or branches. Further study in this respect is needed for more identification.

Data in Table (23) showed that any of the applied biofertilizer treatments either single or mixed produced slightly significant decrease in C F content of Prosopis species with higher magnitudes in branches rather than leaves as compared with the control, these results were noticed in all seasons of the two growing years. Whereas, the last mixed biofertilzer treatment (Rhizobium + Azotobacter) was less effective in producing higher C F content than the other mixed treatments (Rhizobium + Azospirillum). This is true with slight variable magnitude.

These results may be due to the outstanding effect of biofertilizers in producing more proliferation of vegetative growth in favour of branches rather than leaves. Such favourable tender growth of plant could be more likely due to the effect of biofertilizers in modifying the soil condition in respect of physical, chemical status of the soil. This in addition mineralization and availability of nutrient and water to plants. Also, organic matter and soil microflora will definitely exert its outstanding effect on the vegetative growth with relatively lower in C F content than the other more usefull constituents.

Data in Table (24, A11 and A12) represent the interaction effect of the applied three factors on CF content of leaves and branches of each the two Prosopis species was slightly significant during autumn-2006 for leaves and during the two autumn-2005/2006 as well as during spring- 2006 for branches.

It is generally noticed that highest CF content was obtained for *Prosopis juliflora* when planted at 4 meter apart (525 plant / fed) between plants without applying fertilization treatment (control) for leaves and branches during both spring and autumn seasons of the first year. This result was not true during the two seasons of second growing year where 2 meter apart (1050 plant / fed) between plants was responsible for producing the highest CF content in leaves and branches without fertilization treatment.

Such higher CF content of *Prosopis juliflora* planted at 2 meter distance between plants (1050 plant / fed) without fertilization could be very well accepted. This is due to the starving plants (without fertilization) planted in on intensive status (2 meter apart -1050 plant / fed) will encourage plants for elongation search for light and nutrients due to the prevailing intensive cultivation.This will create more longer branches of higher CF content rather than leaves plants.

Whereas, the lowest CF content of *Prosopis chilensis* planted at 3 meter distance between plants (700 plant / fed) and fertilized with the mixed biofertilizer treatment Rhizobium + Azotobacter. This result was noticed for all seasons except during the first spring of the first established year.

Table (24): Effect of the second order interactions on crude fiber % of leaves and branches of Prosopis plants during spring and autumn of the two growing years.

Bio.	D.	Crude fiber % of leaves							
		2005				2006			
		Spring		Autumn		Spring		Autumn	
		Species				Species			
		Sp1	Sp2	Sp1	Sp2	Sp1	Sp2	Sp1	Sp2
B*D*SP Cont.	2 m	21.60	23.59	25.19	25.61	25.77	26.01	26.07	26.58
	3 m	22.62	24.04	24.94	25.45	25.38	25.75	25.78	26.19
	4 m	23.43	24.90	25.38	25.73	25.64	25.87	25.93	26.53
Rhiz.	2 m	21.18	23.03	24.95	25.40	25.54	25.87	25.97	26.44
	3 m	21.92	23.73	24.62	25.25	25.08	25.59	25.66	25.90
	4 m	22.80	24.14	25.16	25.47	25.52	25.75	25.74	26.32
Rhiz. + Azos.	2 m	20.95	22.78	24.54	24.87	25.35	25.68	25.87	26.30
	3 m	21.57	23.41	24.39	24.72	24.84	25.33	25.51	25.75
	4 m	22.54	23.93	24.80	24.97	25.19	25.53	25.51	26.11
Rhiz. + Azot.	2 m	20.44	22.58	24.28	24.54	25.10	25.26	25.75	26.16
	3 m	21.21	22.69	24.01	24.41	24.56	25.00	25.39	25.64
	4 m	21.92	23.30	24.47	24.69	24.91	25.13	25.41	25.84
L.S.D at 5%		N.S		N.S		N.S		0.05	
		Crude fiber % of branches							
Cont.	2 m	28.39	29.13	31.33	31.54	31.65	31.91	32.73	32.93
	3 m	28.57	29.27	31.08	31.35	31.46	31.68	32.37	32.59
	4 m	28.78	29.71	31.49	31.76	31.57	31.81	32.46	32.79
Rhiz.	2 m	28.01	28.30	31.17	31.38	31.52	31.76	32.45	32.74
	3 m	28.35	28.52	30.66	31.22	31.26	31.51	32.04	32.43
	4 m	28.63	28.93	31.39	31.59	31.49	31.70	32.34	32.60
Rhiz. + Azos.	2 m	27.46	27.86	30.88	31.17	31.39	31.66	32.19	32.47
	3 m	27.67	28.02	30.38	31.03	30.93	31.42	31.65	32.21
	4 m	27.84	28.36	31.24	31.36	31.31	31.56	32.06	32.35
Rhiz. + Azot.	2 m	27.19	27.26	30.72	31.00	31.13	31.50	31.87	32.18
	3 m	27.47	27.65	30.24	30.86	30.66	31.27	31.40	31.93
	4 m	27.68	28.01	30.87	31.06	30.98	31.36	31.71	32.06
L.S.D at 5%		N.S		0.08		0.08		0.08	

3-Total carbohydrate percentage:

Data in Table (25, A13 and A14) present the total carbohydrate contents (Nitrogen Free Extract – NFE) of leaves and branches of the two Prosopis species as affected by the applied factors.

It is well noticed that *Prosopis chilensis* was slightly significant in possessing higher total carbohydrate contents than *Prosopis juliflora.* This result was recorded for each of the two seasons of the two years, with slightly higher magnitudes for leaves rather than branches. Such results were slightly significant in all season except the first spring of the established year.

Data in Table (25) indicated that distance between plants exerted slight significant effect on the total carbohydrate content of leaves and branches, being higher in leaves than branches for the two Prosopis species. As the distance between plants increased from 2 to 3 up to 4 meter apart there was substantial slight significant increase in total carbohydrate content of leaves and branches of Prosopis species.

Such results were slightly significant in all season except during first spring of the established year. Similar results were obtained by **El-Hossini (1990)** who found that carbohydrate percentage content of pigeon pea branches increased as a result of widening distance between hills, with insignificant difference.

Along the same line, **Khalifa (1996)** reported that *Acacia Canecens* cultivated at 1.0 meter produced a high carbohydrate content. Meanwhile, *Acacia saligna* cultivated at 2.0 meter gave low carbohydrate content.

Regarding the response of carbohydrate content, results presented in Table (25) showed slight significant effect any of the applied biofertilizer treatments on total carbohydrate content for the two Prosopis species in all of the studied seasons of the two growing years. Olso, Rhizobium + Azotobacter treatment

Table (25): Effect of Prosopis species, planting distances and Biofertilizer treatments on total carbohydrate % of leaves and branches during spring and autumn of the two growing years.

Seasons		Total carbohydrate % of leaves				Total carbohydrate % of branches			
		2005		2006		2005		2006	
		Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
SP	SP1	43.29	43.68	44.18	45.05	37.31	38.28	38.88	39.83
	SP2	42.97	43.54	44.08	44.66	36.30	38.09	38.44	39.63
L.S.D at 5%		0.28	0.09	0.03	0.09	0.92	0.05	0.14	0.14
D	2 m	42.71	43.47	43.90	44.65	36.37	37.93	38.46	39.26
	3 m	43.17	43.58	44.16	44.78	36.76	38.20	38.66	39.81
	4 m	43.51	43.79	44.34	45.15	37.29	38.42	38.87	40.11
L.S.D at 5%		0.20	0.03	0.03	0.02	0.15	0.03	0.07	0.04
B	C.	42.20	43.19	43.74	44.50	36.01	37.75	38.28	39.32
	R.	42.95	43.44	43.99	44.73	36.69	38.15	38.58	39.63
	R+S	43.36	43.65	44.30	44.98	36.97	38.33	38.80	39.86
	R+T	44.01	44.16	44.49	45.21	37.56	38.51	39.00	40.10
L.S.D at 5%		0.21	0.03	0.03	0.03	0.23	0.03	0.04	0.05

Sp = Species D = Distances B =Biofertilizer.

was the best among the other two biofertilizer treatments (Rhizobium or Rhizobium + Azospirillum) either for their leaves or branches as compared with the control (without fertilization).

Datata in Table (26, A13 and A14) showed interaction effect for the applied three factors under study on the total carbohydrate content of leaves and branches for each the two Prosopis species with siginficant effect during spring and autumn seasons of the second year for leaves and during the two autumn-2005/2006 as well as during the second spring season for branches.

It well noticed in general that the highest total carbohydrate content was obtained for each the two Prosopis species when planted at 4 meter distance apart and fertilized with the mixed biofertilizer treatment (Rhizobium + Azotobacter). Whereas, the lowest total carbohydrate content was obtained of each the two Prosopis species when planted at 2 meter distance apart without biofertilizer treatment (control) for either leaves or branches.

Table (26): Effect of the second order interactions on total carbohydrate % of leaves and branches of Prosopis plants during spring and autumn of the two growing years.

	Bio.	D.	Total carbohydrate % of leaves							
			2005				2006			
			Spring		Autumn		Spring		Autumn	
			Species				Species			
			Sp1	Sp2	Sp1	Sp2	Sp1	Sp2	Sp1	Sp2
B*D*SP	Cont.	2 m	42.06	41.58	43.01	42.85	43.42	43.47	44.44	44.08
		3 m	42.53	41.95	43.22	43.11	43.89	43.66	44.62	44.23
		4 m	42.91	42.19	43.51	43.42	44.11	43.91	45.00	44.63
	Rhiz.	2 m	42.49	42.30	43.38	43.18	43.75	43.76	44.74	44.31
		3 m	43.05	43.03	43.44	43.32	44.16	43.88	44.86	44.40
		4 m	43.54	43.31	43.72	43.56	44.28	44.13	45.27	44.80
	Rhiz. + Azos.	2 m	42.83	43.00	43.64	43.48	43.99	44.20	44.92	44.68
		3 m	43.48	43.26	43.68	43.56	44.38	44.26	45.12	44.62
		4 m	44.05	43.54	43.83	43.70	44.56	44.39	45.48	45.07
	Rhiz. + Azot.	2 m	43.90	43.52	44.16	44.02	44.34	44.28	45.17	44.82
		3 m	44.21	43.87	44.20	44.06	44.58	44.46	45.35	45.00
		4 m	44.42	44.12	44.30	44.23	44.73	44.58	45.63	45.30
	L.S.D at 5%		N.S		N.S		0.07		0.07	
			Total carbohydrate % of branches							
	Cont.	2 m	36.38	34.88	37.67	37.41	38.15	37.95	38.92	38.84
		3 m	36.88	35.25	37.99	37.58	38.53	38.07	39.66	39.15
		4 m	37.22	35.43	38.03	37.80	38.73	38.23	39.78	39.61
	Rhiz.	2 m	36.88	35.80	37.86	37.84	38.62	38.16	39.24	39.12
		3 m	37.22	35.74	38.27	38.08	38.79	38.38	39.81	39.58
		4 m	37.59	36.90	38.51	38.32	38.95	38.57	40.19	39.86
	Rhiz. + Azos.	2 m	37.07	36.05	38.14	37.95	38.89	38.30	39.35	39.39
		3 m	37.53	36.03	38.41	38.25	39.01	38.57	40.07	39.83
		4 m	37.83	37.30	38.68	38.55	39.17	38.86	40.37	40.17
	Rhiz. + Azot.	2 m	37.28	36.61	38.44	38.17	39.10	38.48	39.59	39.65
		3 m	37.79	37.64	38.56	38.43	39.25	38.70	40.36	40.05
		4 m	38.12	37.92	38.81	38.63	39.42	39.03	40.64	40.29
L.S.D at 5%			N.S		0.76		0.09		0.12	

Meanwhile, there was significant differences in total carbohydrate content between each of the 3 applied biofertilizer treatments. Highest total carbohydrate content was obtained when using the mixed biofertilizer treatment of Rhizobium + Azotobacter being significantly higher than the other mixed treatments Rhizobium + Azospirillum.

Moreover, each of the two mixed biofertilizer treatments (Rhizobium + Azotobacter or Rhizobium + Azospirillum) produced significantly higher carbohydrate content than the single biofertilizer treatment (Rhizobium) or the control (without fertilization).

From the above results, it looks to be true that the widest distance between plants was more responsible for penetrating enough of more efficient photosynthetic active radiation (PAR) capable for formulating and accumulating more carbohydrate contents in leaves and branches of Prosopis plants. Moreover, the mixed biofertilizer treatments helped in enhancing the edaphic soil conditions physically, chemically, organic matter and microfloral status, which all contribute in creating nice favourable circumstances for proper physiological functions and total carbohydrate formation and accumulation in leaves and branches of Prosopis plants.

4-Total ash percentage:

Results in Table (27, A15 and A16) represent the effect of each of the applied factors on total ash content of leaves and branches for Prosopis plants during spring and autumn seasons of the two growing years. It is noticed that *Prosopis juliflora* was slightly significant in possessing higher total ash content than *Prosopis chilensis*, with slightly higher magnitudes for leaves rather than branches.

Such results were slightly significant in all seasons except for branches

Table(27): Effect of Prosopis species, planting distances and biofertilizer treatments on total ash% of leaves and branches during spring and autumn of the two growing years.

Seasons		Total ash % of leaves				Total ash % of branches			
		2005		2006		2005		2006	
		Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
SP	SP1	14.42	17.50	15.40	16.15	11.56	12.17	11.51	12.38
	SP2	15.79	17.90	15.62	16.69	11.05	13.20	12.02	12.67
L.S.D at 5%		0.80	0.11	0.04	0.02	N.S	0.05	0.07	0.03
D	2 m	15.11	17.81	15.70	16.69	11.63	12.89	11.98	13.05
	3 m	15.03	17.45	15.31	16.14	11.20	12.50	11.55	12.08
	4 m	15.17	17.85	15.52	16.43	11.07	12.67	11.76	12.45
L.S.D at 5%		N.S	0.10	0.04	0.04	0.41	0.05	0.03	0.04
B	C.	14.48	17.42	15.22	16.01	10.51	12.37	11.44	12.18
	R.	15.01	17.60	15.40	16.28	11.00	12.59	11.66	12.40
	R+S	15.14	17.80	15.60	16.55	11.47	12.82	11.88	12.62
	R+T	15.78	17.99	15.81	16.84	12.22	12.97	12.06	12.89
L.S.D at 5%		0.39	0.08	0.02	0.04	0.34	0.03	0.02	0.03

Sp = Species **D** = Distances **B** =Biofertilizer.

during the first established spring season. These finding are in agreement with those obtained by **Khalifa (1996)**. The superiority for *Prosopis juliflora* than *Prosopis chilensis* in accumulating more ash content in their leaves and branches is a proof for its higher capability for absorbing and accumulating more of nutrients and minerals in their leaves and branches. Such character could be a nique feuture for growth and survival for such particular Prosopis species (*Prosopis juliflora*).

The applied distance between plants of Prosopis species did not exert specific trend on the ash content of their leaves and branches as it is clear from Table (27, A15 and A16). This is because the range of ash content was very much narrow and the obtained values of ash content were fluctuated and scattered of no specific trend to be detected in a clear reasonable logical manner. Further study is this respect is needed in future with modified and refined research plants fit that purpose.

The applied biofertilizer treatments caused significant increase total ash content of leaves and branches for *Prosopis chilensis* and *Prosopis juliflora* in spring and autumn seasons of the two growing years 2005-2006 as shown in Table (27). Any of the applied biofertilizer treatments either single or mixed produced slightly significant increase in total ash content of each of the two Prosopis species either in their leaves or branches as compared with the control (without fertilization).

These results were noticed in all seasons of the two growing years. Among the applied 3 biofertilizer treatments, Rhizobium + Azospirillum and Rhizobium + Azotobacter produced slightly higher total ash content in leaves and branches for each of the two Prosopis species in their leaves and branches as compared with the single biofertilizer treatment (Rhizobium). Whereas, the last mixed biofertilzer treatment (Rhizobium + Azotobacter) was the most effective in producing higher total ash content than the other mixed treatment (Rhizobium + Azospirillum).

The effect of the applied mixed biofertilizer treatments on ash accumulation of leaves and branches of Prosopis plants may represent its benefits and undrantages in providing well prepored soil of better potentiality in providing plants with enough mimeral and nutrients that appeared in their tissues as described earlier.

It is clear from Table (28, A15 and A16) that the interaction effect of the applied treatments (Prosopis species, distances between plants and biofertilizer treatments) on ash contents of plants was significant. *Prosopis juliflora* was slightly significant in possessing higher total ash content than *Prosopis chilensis*. This result was recorded during the second autumn seasons of the second year for their leaves and during the two autumn and during the second

Table (28): Effect of the second order interactions on total ash % of leaves and branches of Prosopis plants during spring and autumn of the two growing years.

	Bio.	D.	Total ash % of leaves							
			2005				2006			
			Spring		Autumn		Spring		Autumn	
			Species				Species			
			Sp1	Sp2	Sp1	Sp2	Sp1	Sp2	Sp1	Sp2
B*D*SP	Cont.	2 m	13.99	15.32	17.47	17.62	15.29	15.59	16.07	16.55
		3 m	13.72	14.68	17.03	17.22	14.89	15.13	15.49	16.01
		4 m	14.35	14.82	17.30	17.86	15.05	15.38	15.62	16.32
	Rhiz.	2 m	14.30	15.58	17.56	17.86	15.49	15.70	16.27	16.88
		3 m	14.03	16.11	17.26	17.43	15.05	15.33	15.77	16.15
		4 m	14.81	15.24	17.44	18.04	15.33	15.52	16.01	16.63
	Rhiz. + Azos.	2 m	14.33	16.01	17.68	18.09	15.71	15.87	16.41	17.10
		3 m	14.04	16.43	17.42	17.66	15.28	15.49	16.12	16.48
		4 m	14.51	15.54	17.60	18.33	15.54	15.73	16.25	16.92
	Rhiz. + Azot.	2 m	15.01	16.36	17.89	18.27	15.90	16.07	16.85	17.37
		3 m	14.62	16.64	17.58	17.97	15.53	15.76	16.35	16.77
		4 m	15.33	16.75	17.79	18.43	15.73	15.87	16.65	17.08
	L.S.D at 5%		N.S		N.S		N.S		0.09	
			Total ash % of branches							
	Cont.	2 m	11.07	10.02	12.05	13.10	11.51	11.89	12.42	13.04
		3 m	10.56	10.34	11.71	12.63	10.87	11.52	11.68	11.77
		4 m	10.80	10.28	11.84	12.87	11.13	11.71	12.07	12.13
	Rhiz.	2 m	11.89	10.87	12.31	13.36	11.67	12.15	12.61	13.30
		3 m	11.25	10.68	11.97	12.83	11.10	11.70	11.87	12.03
		4 m	10.81	10.52	11.96	13.09	11.39	11.96	12.30	12.31
	Rhiz. + Azos.	2 m	12.39	11.68	12.44	13.56	11.85	12.30	12.81	13.51
		3 m	11.62	10.96	12.12	13.12	11.47	11.89	12.10	12.23
		4 m	11.32	10.86	12.35	13.32	11.59	12.19	12.56	12.53
	Rhiz. + Azot.	2 m	12.92	12.22	12.59	13.69	12.01	12.42	13.05	13.69
		3 m	11.97	12.24	12.29	13.34	11.70	12.13	12.31	12.63
		4 m	12.08	11.86	12.41	13.52	11.79	12.32	12.83	12.84
L.S.D at 5%			N.S		0.07		0.05		0.07	

spring-2006 for branches, with slightly higher magnitudes for leaves rather than branches on total ash content (Table 28).

It is well noticed that highest ash content was recorded for *Prosopis juliflora* planted at 2 meter between apart (1050 plant/fed) receiving Rhizobium +Azotobacter biofertilizer treatments in leaves and branches with few exceptions during spring and autumn seasons of the established year. During such two seasons, *Prosopis juliflora* was superior in ash content than *Prosopis chilensis* when planted at 4 meters apart (525 plant/fed) receiving the same Rhizobium + Azotobacter biofertilizer treatments.

Such obtained variation could be due to the earlier insufficient soil improvement during the first established year, where less number of plants / unit area of land can copenisate its mineral requirements as compared with the intensed plants per unit area of land.

Whereas, the lowest ash content was obtained for *Prosopis chilensis* when planted at 3 meter apart (700 plant / fed) between plants without applying fertilization treatment (control) for leaves and branches during both spring and autumn seasons of the two growing years.

5-Total digestible nutrient (TDN) % :

Results in Table (29, A17 and A18) present the total digestible nutrients (TDN) of leaves and branches of the two Prosopis species as affected by the applied factors, It is noticed that *Prosopis chilensis* was slightly significant in producing higher of total digestible nutrient (TDN) than *Prosopis juliflora.* This result was recorded for each of the two seasons of the two year. Such results were insignificant for leaves in the first spring, with slightly higher magnitudes for leaves rather than branches. In other words, total digestible nutrients were higher in *Prosopis chilensis* than *Prosopis juliflora,* with slight

Table (29) : Effect of Prosopis species, planting distances and biofertilizer treatments on total digestible nutrient (TDN) % of leaves and branches during spring and autumn of the two growing years.

Seasons		TDN % of leaves				TDN % of branches			
		2005		2006		2005		2006	
		Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
SP	SP1	63.49	61.73	61.16	60.73	57.93	56.34	56.04	55.19
	SP2	62.16	61.42	60.89	60.32	57.53	55.97	55.72	54.87
L.S.D at 5%		N.S	0.06	0.05	0.14	0.12	0.08	0.10	0.05
D	2 m	63.22	61.51	60.80	60.27	57.81	56.05	55.69	54.83
	3 m	62.87	61.76	61.26	60.74	57.79	56.42	56.05	55.25
	4 m	62.37	61.44	61.02	60.56	57.58	56.00	55.90	55.01
L.S.D at 5%		N.S	0.04	0.02	0.03	0.15	0.04	0.07	0.02
B	C.	62.09	61.08	60.69	60.12	56.95	55.80	55.55	54.65
	R.	62.69	61.39	60.88	60.44	57.49	56.04	55.78	54.89
	R+S	63.01	61.78	61.12	60.67	58.08	56.28	55.94	55.16
	R+T	63.50	62.05	61.42	60.88	58.41	56.51	56.26	55.44
L.S.D at 5%		N.S	0.05	0.04	0.02	0.19	0.03	0.07	0.03

Sp = Species D = Distances B =Biofertilizer.

significant difference in all season except for the first spring of the first growing year.

Data in Table (29) indicated that distance between plants showed slight significant effect on the total digestible nutrients for leaves and branches for the two Prosopis species during all seasons, with few exceptions of the leaves and branches in the first spring of the established year where differences in this parameter were not significant.

Results clarified that as the distance between plants increased from 2 to 3 meters apart slight significant increase in total digestible nutrient of leaves and branches were obtained except during spring of the first established year.However, extra increase in distance between plants (4 meter apart- 525 plant/fed) slightly decreased TDN of leaves and branches of the two Prosopis species. Such result may indicate that the medium distance between plants create better micro-environment for mineral availability absorbition and all of the convement proper growth and development than the narrower or wider distance between plants. Intensity of plants per unit area of land may contribute well in creating such situation.

Results presented in Table (29) showed slight significant effect of biofertilizer treatments on total digestible nutrient of leaves and branches of the two Prosopis species in the studied seasons of the two growing years, with insignificant differences for leaves in the spring of the established year.

Any of the applied biofertilizer treatments either single or mixed produced slightly significant increase in total digestible nutrient for each of the two Prosopis species either in their leaves or branches as compared with the control (without fertilizations), these results were noticed in all seasons of the two growing years.

Meanwhile, the mixed biofertilzer treatment (Rhizobium + Azotobacter) was more effective in producing higher total digestible nutrients than the other mixed treatment (Rhizobium + Azospirillum). This result was true for the studied seasons.

Here again such results insure the effect of biofertilzers in enhancing soil properties in respect of physical, chemical and microfloral status.This in addition to the wide-scope for the effect of organic matter and its relation to extra extended benefits of required soil microflora and its function for plenty of benefits to soil-plant-water interactions which all reflected in proper growth and development of plants of better components in respect of total digestible nutrients.

Results in Table (30, A17 and A18) present the interaction effect of the applied 3 factors (Prosopis species, distance between plants and biofertilization treatments) on total digestible nutrient content of leaves and branches for each the two Prosopis species.

Table (30): Effect of the second order interactions on total digestible nutrient % of leaves and branches of Prosopis plants during spring and autumn of the two growing years.

Bio.	D.	TDN % of leaves							
		2005				2006			
		Spring		Autumn		Spring		Autumn	
		Species				Species			
		Sp1	Sp2	Sp1	Sp2	Sp1	Sp2	Sp1	Sp2
B*D*SP									
Cont.	2 m	63.36	61.80	61.18	60.85	60.56	60.36	60.40	59.66
	3 m	62.77	61.52	61.49	61.05	61.06	60.73	60.87	60.13
	4 m	62.08	61.00	61.09	60.80	60.82	60.58	60.57	59.82
Rhiz.	2 m	63.85	62.34	61.51	61.10	60.77	60.55	60.76	59.95
	3 m	63.48	61.94	61.86	61.34	61.33	60.92	61.21	60.55
	4 m	62.80	61.77	61.40	61.14	60.97	60.71	60.87	60.22
Rhiz. + Azos.	2 m	64.16	62.65	61.88	61.60	60.96	60.79	60.99	60.15
	3 m	63.83	62.29	62.09	61.79	61.57	61.17	61.48	60.76
	4 m	63.08	62.03	61.73	61.57	61.31	60.93	61.24	60.48
Rhiz. + Azot.	2 m	64.62	62.98	62.11	61.88	61.21	61.17	61.28	60.39
	3 m	64.20	62.97	62.42	62.09	61.83	61.46	61.79	60.95
	4 m	63.62	62.60	62.01	61.81	61.56	61.29	61.50	60.79
L.S.D at 5%		N.S		N.S		N.S		0.04	
		TDN % of branches							
Cont.	2 m	57.29	56.71	55.86	55.56	55.57	55.24	54.57	54.34
	3 m	57.40	56.68	56.20	55.81	55.85	55.52	54.97	54.72
	4 m	57.15	56.45	55.92	55.44	55.74	55.38	54.80	54.50
Rhiz.	2 m	57.76	57.41	56.05	55.82	55.73	55.51	54.83	54.55
	3 m	57.72	57.39	56.57	56.10	56.13	55.82	55.30	54.91
	4 m	57.47	57.21	55.99	55.71	55.87	55.59	54.98	54.73
Rhiz. + Azos.	2 m	58.29	57.95	56.31	56.04	55.88	55.63	55.08	54.82
	3 m	58.35	57.94	56.90	56.28	56.34	55.93	55.66	55.16
	4 m	58.14	57.79	56.20	55.96	56.08	55.76	55.27	54.98
Rhiz. + Azot.	2 m	58.62	58.49	56.51	56.24	56.13	55.80	55.39	55.08
	3 m	58.58	58.28	57.06	56.46	56.71	56.12	55.88	55.42
	4 m	58.37	58.10	56.54	56.25	56.38	56.39	55.58	55.27
L.S.D at 5%		N.S		0.08		0.17		0.07	

It is generally noticed that highest total digestible nutrients content was obtained for *Prosopis chilensis* when planted at 3 meter distance *Prosopis juliflora* (700 plant / fed) and fertilized with the mixed biofertilizer treatment (Rhizobium + Azotobacter) for leaves and branches. This result was noticed in all seasons except spring of the established year. Whereas, the lowest total digestible nutrients were recorded for *Prosopis juliflora* planted at 2 or 4 meter between plants without fertilization (control) for leaves and branches with few exceptions among distance between plants (2 or 4 meter apart).

6- Digestible protein (DP) %:

Data in Table (31, A19 and A20) indicated that leaves and branches of the two Prosopis species as affected by the applied factors. It look to be true that *Prosopis chilensis* was slightly significant in possessing higher digestible protein than *Prosopis juliflora.* This result was observed during the two studied seasons (spring and autumn) of the two years(2005-2006) with slightly higher magnitudes for leaves rather than branches. Such results were slightly significant in all season except for spring of the established year.

Increasing plant distance between plants from 2 to 3 meters apart caused slight significant increase in digestible protein (DP) of leaves and branches during all seasons of the two growing years. However, extra increase in distance between plants (4 meter apart) slightly decreased DP content of leaves and branches of Prosopis species. This result was noticed for all seasons except during spring of the established year for branches.

So, it could be generally concluded that 3 meter distance between plants was more favourable for producing higher DP content in leaves and branches of Prosopis species.

The applied biofertilizer treatments caused slight significant increase in

Table (31): Effect of Prosopis species, planting distances and biofertilizer treatments on digestible protien (DP) % of leaves and branches during spring and autumn of the two growing years

Seasons		DP % of leaves				DP % of branches			
		2005		2006		2005		2006	
		Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
SP	SP1	10.17	11.12	10.59	10.36	7.25	8.81	8.62	7.97
	SP2	9.85	11.00	10.49	10.10	7.00	8.44	8.30	7.76
L.S.D at 5%		0.19	0.07	0.02	0.03	0.19	0.04	0.10	0.02
D	2 m	9.77	10.92	10.25	9.96	6.83	8.40	8.23	7.66
	3 m	10.09	11.21	10.76	10.41	7.25	8.82	8.66	8.08
	4 m	10.16	11.05	10.61	10.32	7.29	8.66	8.49	7.85
L.S.D at 5%		0.07	0.03	0.01	0.02	0.06	0.05	0.08	0.02
B	C.	9.37	10.64	10.28	9.61	6.51	8.26	8.09	7.55
	R.	9.90	11.02	10.44	10.15	6.96	8.54	8.43	7.78
	R+S	10.22	11.22	10.65	10.44	7.39	8.77	8.55	7.98
	R+T	10.55	11.35	10.80	10.72	7.64	8.95	8.77	8.14
L.S.D at 5%		0.09	0.04	0.01	0.01	0.09	0.02	0.09	0.02

Sp = Species D = Distances **B** =Biofertilizer.

DP content of leaves and branches of Prosopis species in all seasons of the two growing years as shown in Table (31). Any of the applied biofertilizer treatments either single or mixed produced slightly significant increase in DP content of Prosopis plants either in their leaves or branches as compared with the control (without fertilizations). These results were noticed in all seasons of the two growing years.

Among the applied 3 biofertilizer treatments, Rhizobium + Azospirillum and Rhizobium + Azotobacter produced slightly higher DP content in leaves and branches for Prosopis plants as compared with the applied single biofertilizer treatment (Rhizobium). Whereas, the last mixed biofertilzer treatment (Rhizobium + Azotobacter) was more effective in producing highest DP content than the other mixed treatment (Rhizobium + Azospirillum).

In conclusion, Rhizobium + Azotobacter was better than Rhizobium + Azospirillum treatment, which in term was better than the single biofertilizer treatment Rhizobium with slight significant diffrences . This result was true with slight variable magnitudes.

Results in Table (32, A19 and A20) represent the interaction effect of the applied 3 factors on DP content of leaves and branches for each the two Prosopis species in the different seasons in the two growing years.

It is generally noticed that highest DP content was obtained for *Prosopis chilensis* when planted at 3 meter distance apart (700 plant/fed) and fertilized with the mixed biofertilizer treatment Rhizobium + Azotobacter for their leaves and branches.

These results were significant during spring and autumn of the second growing year for Prosopis leaves, whereas such difference were only significant for branches during the two autumn seasons of 2005 and 2006.

I conclusion, it looks to be true that the chemical analysis of the large number of samples for each of the two growing years and each of the two spring and autumn seasons in its leaves and branches for plants of the two Prosopis species showed a limited range of each difference for the response of each single chemical component (C.P, C.F, NFE, Ash content, TDN and DP).These results may due to the insinsitivity of the studied parameter for the applied treatments (species, distances apart and the applied biofertilizers) and / or for other unknow factors. Such limited variations in chemical constituents need further study under more controlled design of modified procedure.

Meanwhile, the obtaind results may affected by clarify the differences of the prevailing environmental factors and the seasonal time intervals of the first and second years on the DP content of leaves and branches of the two varied Prosopis species.

Table (32): Effect of the second order interactions on digestible protien (DP)% of leaves and branches of Prosopis plants during spring and autumn of the two growing years.

Bio.	D.	DP % of leaves							
		2005				2006			
		Spring		Autumn		Spring		Autumn	
		Species				Species			
		Sp1	Sp2	Sp1	Sp2	Sp1	Sp2	Sp1	Sp2
B*D*SP									
Cont.	2 m	9.32	9.02	10.54	10.47	9.99	9.94	9.56	9.15
	3 m	9.76	9.17	10.88	10.70	10.59	10.43	10.06	9.66
	4 m	9.47	9.45	10.66	10.58	10.45	10.27	9.75	9.49
Rhiz.	2 m	9.82	9.38	10.96	10.74	10.11	10.19	10.07	9.67
	3 m	10.27	9.67	11.25	11.09	10.74	10.63	10.40	10.23
	4 m	10.20	10.05	11.08	10.99	10.64	10.36	10.35	10.17
Rhiz. + Azos.	2 m	10.20	9.73	11.15	11.05	10.27	10.45	10.34	9.94
	3 m	10.55	10.01	11.42	11.27	10.92	10.79	10.68	10.50
	4 m	10.45	10.36	11.26	11.18	10.90	10.54	10.70	10.46
Rhiz. + Azot.	2 m	10.45	10.24	11.26	11.16	10.42	10.66	10.62	10.32
	3 m	10.84	10.45	11.57	11.48	11.06	10.94	10.96	10.80
	4 m	10.69	10.64	11.35	11.25	11.01	10.71	10.86	10.75
L.S.D at 5%		N.S		N.S		0.02		0.03	
		DP % of branches							
Cont.	2 m	6.26	6.17	8.24	7.84	8.09	7.68	7.49	7.25
	3 m	6.94	6.37	8.65	8.15	8.48	8.02	7.88	7.63
	4 m	6.69	6.62	8.71	7.97	8.39	7.90	7.60	7.43
Rhiz.	2 m	6.79	6.42	8.43	8.24	8.26	8.14	7.66	7.48
	3 m	7.38	6.81	8.84	8.66	8.83	8.50	8.14	7.85
	4 m	7.25	7.13	8.71	8.34	8.59	8.22	7.84	7.68
Rhiz. + Azos.	2 m	7.17	7.01	8.58	8.43	8.42	8.27	7.83	7.68
	3 m	7.74	7.32	9.19	8.79	8.77	8.61	8.34	8.10
	4 m	7.50	7.58	9.01	8.59	8.81	8.41	8.10	7.87
Rhiz. + Azot.	2 m	7.52	7.30	8.82	8.62	8.59	8.42	8.03	7.82
	3 m	7.97	7.51	9.36	8.93	9.23	8.82	8.45	8.23
	4 m	7.81	7.72	9.18	8.77	8.97	8.61	8.23	8.08
L.S.D at 5%		N.S		0.06		N.S		0.05	

SUMMARY

Research experiment was carried out at Ras Sudr Research Station, Desert Research Center, South Sinai Governorate in spring and autumn seasons during 2005 and 2006 years.

Experiment was designed and implemented to evaluate vegetative growth behaviour, yield and chemical composition of two Prosopis species (*Prosopis chilensis* and *Prosopis juliflora*) as affected by three distances between plants 2, 3 and 4 meter as (1050, 700 and 525 plant/fed) and four biofertilizer treatments (control, Rhizobium, Rhizobium + Azospirillum and Rhizobium + Azotobacter).

Experiment was layed out and statistically analyzed in split split plot design where Prosopis species were randomly distributed in the main plots, while the sub-plots were assigned for the plant spacing and the sub-sub plots were devoted to the biofertilizer treatments. Two individual cuts (simulation of browsing cuts) were obtained during spring and autumn seasons in each of the two growing years. Results could be summarized as follows:

A- Vegetative growth characteristics:

-Plant height:

- *Prosopis chilensis* (sp1) plants were taller than *Prosopis juliflora* (sp2) with significant differences in the two seasons of the two years with various magnitudes.

- The medium distance between plants 3 meter (700 plant / fed) produced tallest Prosopis plants as compared with 2 meter (1050 plant/fed) and/or 4 meter (525 plant/fed) between plants during all seasons except during spring of the established year.

- Prosopis plants fertilized with the biofertilizer treatment Rhizobium + Azotobacter produced the tallest plants, followed by Rhizobium + Azospirillum, then Rhizobium alone, followed by the control with significant differences in between. This trend was noticed during all seasons under study.

-The significant interaction effect of the applied three factors on the heights of plants generally indicated that *Prosopis chilensis* was of the tallest plants, when planted at 3 meter apart (700 plant/fed) and inoculated with Rhizobium + Azotobacter. Whereas, *Prosopis juliflora* was of the shortest plants when planted at 3 meter during spring of the established year and 2 meter during spring and autumn seasons of the second year without fertilization (control) with significant differences.

- Stem diameter:

- *Prosopis chilensis* plants were of the thickest branches compared with *Prosopis juliflora* which were of the thinest branches with significant differences.

-Distance of 3 meter apart between plants produced the thickest stem diameters of plants than 2 and 4 meter during spring-2005 and autumn-2006. Whereas, the wider distance between plants of 4 meter exerted significantly thicker stem diameters of plants during autumn-2005 and spring-2006 seasons.

-Prosopis plants fertilized with the biofertilizer Rhizobium + Azotobacter produced the thichest branches, followed by Rhizobium + Azospirillum, then Rhizobium followed by the control which produced shortest plant with significant differences in between. Similar trend was noticed during all seasons under study. Meanwhile, Prosopis plants without fertilization (control) produced the thinest branches of plant with significant differences during all seasons.

-The highest values of stem diameter was obtained for *Prosopis chilensis* inoculated by Rhizobium + Azotobacter and planted at 3 or 4 meter distance between plants. Whereas, the lowest values were recorded for *Prosopis juliflora* which were obtained without fertilization (control) and planted at 2 meter distance between plants during all seasons except during spring of the established year with significant differences during spring-2005 and autumn-2006 seasons.

- Height of the initiative branching point:

-*Prosopis chilensis* plants were of significant taller branching point as compared with *Prosopis juliflora* with various magnitudes within the different seasons.

-Highest branching point was obtained for the narrowest planting distance (2m) and substantially decreased with slight significant differences as the distance between plants increased from 2 meter (1050 plant/fed) to 3 meter (700 plant/fed) and up to 4 meter (525 plant/fed) during all of the studied seasons of the two years except during spring of the establishment year.

-The mixed biofertilizer treatment Rhizobium + Azotobacter was of higher impact in producing the highest branching point of plants as compared with the other mixed Rhizobium + Azospirillum or single Rhizobium biofertilizer treatments and the control with significant differences during all seasons in a descending order.

-*Prosopis chilensis* was of the significant highest branching point when planted at 2 meters apart (1050 plant/fed) and fertilized with Rhizobium + Azotobacter. Whereas, the shortes branching point was noticed for *Prosopis juliflora* when planted at 4 meters apart (525 plant/fed) without fertilization. This result was true in all seasons except for spring season of the the first established year.

-Number of branches per plant:

-The *Prosopis chilensis* plants were of significant more branching behaviour than *Prosopis juliflora* with slight differences of various magnitudes during all seasons under study.

-The medium distance of 3 meter between plants (700 plant/fed) produced the highest number of branches / plant as compared with 2 meter (1050 plant/fed) or 4 meter (525 plant/fed) in all seasons with significant differences except spring of the established year where 4 meter produced more number of branches / plant than 3 meter with insignificant differences.

-Highest response of the applied biofertilizer treatments on enhancing branching behaviour of plants was for Rhizobium + Azotobacter, Rhizobium + Azospirillum followed by Rhizobium then the control in a significant descending order.

-The interaction of the applied 3 factors on the number of branches / plant did not exert any significant differences during all seasons under study.

- weight / plant on fresh and dry matter basis:

-*Prosopis chilensis* plants were of the heaviest fodder production on fresh and dry matter basis than *Prosopis juliflora* during all seasons except for dry weight of second spring where the difference did not reach the level of significant.

-Fresh and dry fodder weights / plant were significantly increased as the distance between plants increased for all distances 2 meter (1050 plant/fed), 3 meter (700 plant/fed) and 4 meter (525 plant/fed), they followed order 3m > 4m >2m . Such obtained results were noticed in all seasons except during spring of the second year of dry fodder weight / plant.

-Inoculations of Prosopis species with Rhizobium + Azotobacter biofertilizer produced the highest fresh and dry fodder production / plant as compared with

Rhizobium + Azospirillum treatment, Rhizobium alone and the control as well in a descending order with slight significant differences in a variable magnitudes.

-The interaction effect of the applied 3 factors did not show significant response on fresh or dry weight / plant during all seasons under study. However, it is generally noticed that *Prosopis chilensis* was somewhat higher in fresh and dry weight / plant than *Prosopis juliflora* especialy when planted at 3 meter distance apart (700 plant/fed) using Rhizobium + Azotobacter biofertilizer treatment in all seasons except during spring of the established year.

B - Fresh and dry fodder yield:

- Fresh and dry fodder yield of *Prosopis chilensis* was significantly higher in fresh and dry yield production of as compared with *Prosopis juliflora* during spring and autumn seasons of the two growing years.

- As the distance between plants increased from 2 to 3 and up to 4 meter apart, fresh and dry fodder productivity /feddan were substantially and significantly decreased during all of the studied seasons of the two growing years.

-Each of the two mixed biofertilizer treatments Rhizobium + Azotobacter or Rhizobium + Azospirillum produced significantly higher fresh and dry fodder yield than the single biofertilizer treatment of Rhizobium and the control as well with significant differences during all of the studied seasons with various magnitudes.

-The interaction effect of the applied 3 factors on fresh or dry fodder yield was not significant during all seasons. it is generally noticed that *Prosopis chilensis* was of the highest fresh and dry fodder yield per feddan than *Prosopis juliflora* when planted at 3 meter distance apart and fertilized with Rhizobium + Azotobacter biofertilizer treatment.

C- Chemical constituents:

-Crud protein (CP) content:

- *Prosopis chilensis* was of the highest CP content than *Prosopis juliflora* in their leaves and brabches with slightly significant differences in all seasons except during the first spring-2005 for branches where the difference did not reach the level of significant.

-Distance of 3 meter between plants was more better for producing slightly higher C P content in leaves and branches of Prosopis species in all seasons except for spring of the established year.

-Biofertilization with Rhizobium + Azotobacter was better than Rhizobium + Azospirillum then Rhizobium followed by the control with slight significant diffrences (in a descending order)on C P content of their leaves and branches in all of the studied seasons. The descending differences were significant of various magnitudes.

-The interaction effect of the applied factors under study (Prosopis species, distance between plants and biofertilization treatments)on CP content of leaves and branches for Prosopis plants was significant during spring-2006 for leaves and during the two autumn seasons (2005/2006) for branches. The highest CP content was obtained for *Prosopis chilensis* when planted at 3 meter distance apart and fertilized with the mixed biofertilizer treatment Rhizobium + Azotobacter for leaves and branches. Whereas, the lowest CP content was recorded for *Prosopis juliflora* planted at 2 meter apart without fertilization.

- Crud fiber (CF) content:

-The *Prosopis juliflora* proved to have the highest CF content as compared with *Prosopis chilensis* which have lower CF content with significant differences for leaves and branches during all of the studied seasons.

-Increasing distance between plants from 2 to 3 meters apart caused substantial slight significant decrease in C F content of leaves and branches during all seasons except during spring of the established year.

-Any of the applied biofertilizer treatments either single or mixed (Rhizobium + Azotobacter, Rhizobium + Azospirillum and Rhizobium) produced slightly significant decrease in C F content of either Prosopis species (*Prosopis chilensis* and *Prosopis juliflora*) in their leaves or branches as compared with the control, in all seasons of the two growing years.

-The interaction effect between factors under study (Prosopis species, distance between plants and biofertilization treatments) on CF content of leaves and branches of Prosopis species was slightly significant during autumn-2006 for leaves and during the two autumn-2005/2006 as well as during spring-2006 for branches. Highest CF content was obtained for *Prosopis juliflora* at 4 meter apart (525 plant / fed), distance between plants during both spring and autumn seasons of the established year, without applying fertilization treatment (control) for leaves and branches. This result was not true during the two seasons of second growing year where 2 meter apart (1050 plant / fed) between plants was responsible for producing the highest CF content in leaves and branches without fertilization treatment.

- Total carbohydrate content(NFE):

-The *Prosopis chilensis* was of the highest NFE contant compared with *Prosopis juliflora* for their leaves and branches during all studied seasons with slightly significant differences.

-As the distance between plants increased from 2 meter (1050 plant/fed) to 3 meter (700 plant/fed) up to 4 meter (525 plant/fed) apart there was slight subsequent significant increase in NFE content of leaves and branches of Prosopis species.

-Biological fertilization treatment Rhizobium + Azotobacter treatment produced the highest total carbohydrate content Prosopis branches and leaves, followed by Rhizobium + Azospirillum, then Rhizobium, followed by the control in a descending order as noticed in all seasons with variable significant magnitudes.

-*Prosopis chilensis* produced of highest total carbohydrate content when planted at 4 meter distance apart and fertilized with the mixed biofertilizer treatment (Rh izobium + Azotobacter).This result was noticed in all seasons. However, the lowest NFE content was recorded for *Prosopis juliflora* when planted at 2 meter apart without fertilization in all seasons.

- Total ash content:

- The highest ash content was recorded for *Prosopis juliflora*, whereas *Prosopis chilensis* have lowest ash content for their leaves and branches during all seasons except for branches of spring of the established year.

- Distance between plants of Prosopis species did not exert specific trend on the ash content of their leaves and branches. This is because the range of ash content was very much narrow and the obtained values of ash content were fluctuated and scattered of no specific trend to be detected in a clear reasonable logical manner.

-Biofertilization with Rhizobium + Azotobacter was better than Rhizobium + Azospirillum then Rhizobium followed by the control with slight significant diffrences on ash content in leaves and branches for each of the two Prosopis plants during all seasons.

-Highest ash content was recorded for *Prosopis juliflora* at 2 meter between plants (1050 plant/fed) receiving Rhizobium + Azotobacter biofertilizer treatment in their leaves and branches with few exceptions during spring and autumn seasons of the first established year.

-Total digestible nutrient (TDN) % :

-Total digestible nutrients content was higher in *Prosopis chilensis* than *Prosopis juliflora* for their leaves and branches with slight significant differences in all seasons except during spring of the established year for leaves.

-Increasing distance between plants from 2 to 3 meters gave the highest TDN content for leaves and branches of the two Prosopis species with slight significant differences in all seasons except spring of the established year for leaves.

-Mixed biofertilizer treatment (Rhizobium + Azotobacter), was more effective in producing higher TDN content than the other mixed treatment (Rhizobium + Azospirillum), followed by the single treatment (Rhizobium), then the control with a descending order with significant differences for leaves and branches in all seasons except for leaves during spring-2005.

-The highest TDN content was obtained for *Prosopis chilensis* at 3 meter distance between plants and fertilized with the mixed biofertilizer treatment Rhizobium + Azotobacter. The differences were insignificant on TDN content of leaves during all seasons, meanwhile this result was significant during all seasons except the first spring-2005 of branches.

- Digestible protein (DP) %:

-The *Prosopis chilensis* was of the richest DP content compared with *Prosopis juliflora* which was of the poorest content of DP leaves and branches with significant difference during all seasons.

-Increasing distance between plants of each of the two Prosopis species from 2 to 3 meters apart (700 plant/fed) caused slight significant increase in DP content of their leaves and branches. However, the extra increase in distance between plants 4 meter apart (525 plant/fed) slightly decreased their DP content. This result was noticed for all seasons except during spring of the established year.

-Slight subsequent significant increase in DP content of leaves and branches (of Prosopis species) was recorded for the control treatment, followed by Rhizobium, then Rhizobium + Azospirillum, followed by Rhizobium + Azotobacter for all seasons in an ascending order.

-It is generally noticed that highest DP content was obtained for *Prosopis chilensis* when planted at 3 meter apart (700 plant/fed) and inoculated with the mixed biofertilizer treatment Rhizobium + Azotobacter for leaves and branches during spring and autumn seasons-2006 for leaves, whereas such differences were only significant for branches during the two autumn seasons 2005 and 2006. Meanwhile, the lowest DP content was recorded for *Prosopis juliflora* planted at 2 meter (1050 plant/fed) without fertilization during all seasons in its leaves and branches.

It could be concluded that 3 meter distance between plants fertilized with Rhizobium + Azotobacter produced the highest values of plant height, stem diameter, height of the initiative branching point, number of branches / plant, fresh and dry weight / plant, CP %, TDN % and DP % in this experiments for *Prosopis chilensis* than *Prosopis juliflora.*

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Table (1): Effect of biofertilizer and denisty on plant height(cm) of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species		Mean	Autumn 2005 Species		Mean	Spring 2006 Species		Mean	Autumn 2006 Species		Mean
		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2	
Control	2 m	54.66	46.87	**50.76**	100.62	87.40	**94.01**	150.09	139.38	**144.74**	132.25	123.33	**127.79**
	3 m	58.53	40.61	**49.57**	120.59	105.65	**113.12**	178.51	157.86	**168.18**	148.06	148.83	**148.45**
	4 m	51.60	48.22	**49.91**	108.58	80.38	**94.48**	160.50	149.91	**155.21**	140.08	134.72	**137.40**
	Mean	**54.93**	**45.23**	**50.08**	109.93	91.14	**100.54**	**163.03**	**149.05**	**156.04**	**140.13**	**135.63**	**137.88**
Rhizobium	2 m	61.27	63.87	**62.57**	128.10	115.67	**122.03**	160.75	155.49	**158.12**	149.49	135.82	**142.66**
	3 m	66.39	57.75	**62.07**	152.11	136.37	**144.24**	209.22	182.38	**195.80**	177.24	157.04	**167.14**
	4 m	58.87	55.29	**57.08**	138.43	110.48	**124.45**	186.25	170.76	**178.51**	159.70	146.83	**153.26**
	Mean	**62.18**	**58.97**	**60.57**	139.55	120.94	**130.24**	**185.41**	**169.55**	**177.48**	**162.14**	**146.56**	**154.35**
Rhizobium + Azospirillum	2 m	65.55	65.58	**65.56**	141.88	129.32	**135.60**	174.22	163.06	**168.64**	159.14	148.05	**153.60**
	3 m	68.87	61.16	**65.01**	164.41	152.73	**158.57**	218.52	197.97	**208.24**	186.29	171.36	**178.82**
	4 m	62.91	57.70	**60.30**	152.29	121.51	**136.90**	203.18	181.95	**192.57**	169.84	157.87	**163.86**
	Mean	**65.77**	**61.48**	**63.63**	152.86	134.52	**143.69**	**198.64**	**180.99**	**189.82**	**171.76**	**159.09**	**165.43**
Rhizobium + Azotobacter	2 m	71.24	70.95	**71.09**	150.61	135.25	**142.93**	184.70	175.14	**179.92**	172.97	164.08	**168.53**
	3 m	74.05	64.57	**69.31**	168.03	159.63	**163.83**	230.69	214.78	**222.73**	203.91	185.14	**194.52**
	4 m	66.56	61.53	**64.05**	158.33	129.83	**144.08**	213.90	195.86	**204.88**	185.35	173.07	**179.21**
	Mean	**70.62**	**65.68**	**68.15**	158.99	141.57	**150.28**	**209.76**	**195.26**	**202.51**	**187.41**	**174.09**	**180.75**
Over all means of denisty	2 m	63.18	61.82	**62.50**	130.30	116.98	**123.64**	167.44	158.27	**162.85**	153.47	142.82	**148.14**
	3 m	66.96	56.02	**61.49**	151.29	138.60	**144.94**	209.23	188.25	**198.74**	178.88	165.59	**172.23**
	4 m	59.99	55.68	**57.84**	139.41	110.55	**124.98**	190.96	174.62	**182.79**	163.74	153.12	**158.43**
General means		**63.37**	**57.84**	**60.61**	140.33	122.04	131.19	**189.21**	**173.71**	**181.46**	**165.36**	**153.84**	**159.60**

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	2.15	8.66	1.03	2.58
Denisty	1.02	1.63	3.08	2.50
Biofertilizer	0.90	1.65	1.70	2.02
Species x Denisty	1.47	2.35	4.44	N.S
Species x Biofertilizer	1.27	N.S	N.S	2.86
Denisty x Biofertilizer	1.56	N.S	2.94	N.S
Species x Denisty x Biofertilizer	2.20	N.S	4.16	4.95

Table (2): Effect of biofertilizer and denisty on stem diameter (cm) of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species Sp1	Spring 2005 Species Sp2	Mean	Autumn 2005 Species Sp1	Autumn 2005 Species Sp2	Mean	Spring 2006 Species Sp1	Spring 2006 Species Sp2	Mean	Autumn 2006 Species Sp1	Autumn 2006 Species Sp2	Mean
Control	2 m	0.33	0.27	0.30	1.85	1.78	1.81	3.67	3.57	3.62	4.74	4.47	4.60
	3 m	0.49	0.34	0.42	1.96	1.87	1.92	4.02	3.77	3.90	5.11	4.83	4.97
	4 m	0.46	0.24	0.35	2.08	1.95	2.02	4.34	4.13	4.24	4.93	4.61	4.77
	Mean	**0.43**	**0.29**	0.36	1.96	1.87	1.92	**4.01**	**3.82**	3.92	**4.93**	**4.63**	4.78
Rhizobium	2 m	0.50	0.42	0.46	2.28	2.21	2.25	4.15	3.87	4.01	5.10	5.02	5.06
	3 m	0.67	0.48	0.58	2.38	2.32	2.35	4.44	4.11	4.27	5.81	5.52	5.67
	4 m	0.66	0.53	0.60	2.67	2.55	2.61	4.79	4.30	4.55	5.59	5.33	5.46
	Mean	**0.61**	**0.48**	0.54	2.44	2.36	2.40	**4.46**	**4.09**	4.28	**5.50**	**5.29**	5.40
Rhizobium + Azospirillum	2 m	0.67	0.52	0.60	2.66	2.50	2.58	4.41	4.21	4.31	5.53	5.27	5.40
	3 m	0.84	0.53	0.69	3.21	3.06	3.14	4.68	4.42	4.55	6.21	5.62	5.91
	4 m	0.59	0.59	0.59	3.23	3.13	3.18	4.94	4.66	4.80	5.91	5.50	5.70
	Mean	**0.70**	**0.55**	0.62	3.03	2.90	2.96	**4.68**	**4.43**	4.55	**5.88**	**5.46**	5.67
Rhizobium + Azotobacter	2 m	0.77	0.67	0.72	2.90	2.82	2.86	4.66	4.42	4.54	5.96	5.48	5.72
	3 m	0.94	0.57	0.76	3.38	3.32	3.35	4.90	4.67	4.79	6.53	6.04	6.29
	4 m	0.89	0.64	0.76	3.73	3.62	3.68	5.05	4.85	4.95	6.21	5.72	5.97
	Mean	**0.87**	**0.63**	0.75	3.34	3.25	3.30	**4.87**	**4.65**	4.76	**6.23**	**5.75**	5.99
Over all means of denisty	2 m	0.57	0.47	0.52	2.42	2.33	2.38	4.22	4.02	4.12	5.33	5.06	5.20
	3 m	0.74	0.48	0.61	2.73	2.64	2.69	4.51	4.24	4.38	5.91	5.50	5.71
	4 m	0.65	0.50	0.57	2.93	2.81	2.87	4.78	4.48	4.63	5.66	5.29	5.47
General means		**0.65**	**0.48**	0.57	2.69	2.59	2.64	**4.50**	**4.25**	4.38	**5.64**	**5.28**	5.46

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	0.07	0.05	0.07	0.03
Denisty	0.01	0.03	0.04	0.04
Biofertilizer	0.02	0.04	0.04	0.04
Species x Denisty	0.02	N.S	N.S	0.05
Species x Biofertilizer	0.03	N.S	0.06	0.06
Denisty x Biofertilizer	0.04	0.04	0.07	0.07
Species x Denisty x Biofertilizer	0.05	N.S	N.S	0.10

Table (3): Effect of biofertilizer and denisty on height of the initiative branching point (cm) of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species		Mean	Autumn 2005 Species		Mean	Spring 2006 Species		Mean	Autumn 2006 Species		Mean
		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2	
Control	2 m	3.86	2.80	3.33	16.02	13.68	14.85	18.86	16.86	17.86	19.52	18.18	18.85
	3 m	4.29	2.98	3.64	12.66	12.42	12.54	18.45	16.62	17.54	18.98	17.77	18.37
	4 m	3.24	3.24	3.24	12.70	11.60	12.15	17.80	16.07	16.94	18.75	17.50	18.12
	Mean	3.80	3.01	3.40	13.79	12.57	13.18	18.37	16.52	17.44	19.08	17.81	18.45
Rhizobium	2 m	5.15	4.28	4.71	16.61	14.20	15.40	19.17	17.15	18.16	19.84	18.37	19.11
	3 m	5.65	4.31	4.98	13.42	12.95	13.19	18.79	16.79	17.79	19.34	18.13	18.73
	4 m	4.74	4.91	4.83	13.08	12.00	12.54	18.51	16.21	17.36	19.24	17.70	18.47
	Mean	5.18	4.50	4.84	14.37	13.05	13.71	18.82	16.72	17.77	19.47	18.06	18.77
Rhizobium + Azospirillum	2 m	5.61	4.88	5.24	17.14	15.13	16.14	19.43	17.40	18.42	20.21	18.57	19.39
	3 m	6.34	4.93	5.63	14.45	13.50	13.97	19.18	17.03	18.11	19.70	18.35	19.03
	4 m	5.17	5.35	5.26	13.85	12.57	13.21	18.77	16.59	17.68	19.57	17.96	18.76
	Mean	5.71	5.05	5.38	15.15	13.73	14.44	19.13	17.01	18.07	19.83	18.29	19.06
Rhizobium + Azotobacter	2 m	5.89	5.12	5.51	17.30	15.36	16.33	19.73	17.62	18.67	20.38	18.73	19.55
	3 m	7.02	5.16	6.09	14.69	13.59	14.14	19.37	17.34	18.36	20.00	18.47	19.24
	4 m	5.41	5.66	5.54	14.04	12.88	13.46	19.05	16.79	17.92	19.84	18.26	19.05
	Mean	6.11	5.31	5.71	15.34	13.95	14.65	19.38	17.25	18.32	20.07	18.49	19.28
Over all means of denisty	2 m	5.13	4.27	4.70	16.77	14.59	15.68	19.30	17.26	18.28	19.99	18.46	19.23
	3 m	5.83	4.35	5.09	13.80	13.12	13.46	18.95	16.95	17.95	19.50	18.18	18.84
	4 m	4.64	4.79	4.72	13.42	12.26	12.84	18.53	16.42	17.48	19.35	17.85	18.60
General means		5.20	4.47	4.83	14.66	13.32	13.99	18.93	16.87	17.90	19.61	18.17	18.89

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	0.38	0.06	0.08	0.11
Denisty	0.21	0.06	0.05	0.02
Biofertilizer	0.30	0.06	0.04	0.03
Species x Denisty	0.30	0.08	N.S	0.04
Species x Biofertilizer	N.S	0.09	0.06	0.05
Denisty x Biofertilizer	N.S	0.11	0.07	0.06
Species x Denisty x Biofertilizer	N.S	0.15	0.10	0.08

Table (4): Effect of biofertilizer and denisty on number of branches / plant of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species Sp1	Spring 2005 Species Sp2	Mean	Autumn 2005 Species Sp1	Autumn 2005 Species Sp2	Mean	Spring 2006 Species Sp1	Spring 2006 Species Sp2	Mean	Autumn 2006 Species Sp1	Autumn 2006 Species Sp2	Mean
Control	2 m	4.77	4.22	4.50	27.78	25.22	26.50	44.11	41.66	42.89	37.44	34.33	35.89
	3 m	5.66	5.00	5.33	39.55	36.11	37.83	55.33	50.89	53.11	43.44	40.11	41.78
	4 m	5.11	5.33	5.22	37.00	31.22	34.11	51.11	45.89	48.50	40.55	36.89	38.72
	Mean	5.18	4.85	5.02	34.78	30.85	32.81	50.18	46.15	48.16	40.48	37.11	38.79
Rhizobium	2 m	5.11	4.66	4.89	32.33	28.55	30.44	49.89	46.33	48.11	42.77	37.55	40.16
	3 m	6.00	5.44	5.72	46.89	42.66	44.78	62.33	56.00	59.16	48.77	46.33	47.55
	4 m	5.66	6.22	5.94	41.55	38.22	39.89	58.89	51.66	55.28	44.66	41.44	43.05
	Mean	5.59	5.44	5.52	40.26	36.48	38.37	57.03	51.33	54.18	45.49	41.77	43.59
Rhizobium + Azospirillum	2 m	5.55	5.11	5.33	34.55	31.55	33.05	56.44	51.89	54.17	47.33	42.77	45.05
	3 m	6.78	5.89	6.33	53.44	48.11	50.78	66.78	61.11	63.94	53.66	52.44	53.05
	4 m	6.11	6.77	6.44	49.55	44.55	47.05	62.22	56.89	59.55	51.66	47.55	49.61
	Mean	6.15	5.92	6.03	45.85	41.41	43.63	61.81	56.63	59.22	50.89	47.59	49.24
Rhizobium + Azotobacter	2 m	6.33	5.89	6.11	39.78	35.89	37.83	60.44	55.44	57.94	51.22	46.89	49.05
	3 m	8.11	6.33	7.22	56.44	54.55	55.50	70.66	65.55	68.11	57.77	55.88	56.83
	4 m	6.89	7.33	7.11	53.22	46.78	50.00	66.44	62.22	64.33	54.77	52.44	53.61
	Mean	7.11	6.52	6.81	49.81	45.74	47.78	65.85	61.07	63.46	54.59	51.74	53.16
Over all means of denisty	2 m	5.44	4.97	5.21	33.61	30.30	31.96	52.72	48.83	50.78	44.69	40.39	42.54
	3 m	6.64	5.66	6.15	49.08	45.36	47.22	63.78	58.39	61.08	50.91	48.69	49.80
	4 m	5.94	6.41	6.18	45.33	40.19	42.76	59.67	54.16	56.92	47.91	44.58	46.25
General means		6.01	5.68	5.84	42.67	38.62	40.65	58.72	53.79	56.26	47.84	44.55	46.20

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	0.28	1.58	1.24	1.06
Denisty	0.16	0.73	0.60	0.55
Biofertilizer	0.35	0.75	0.64	0.69
Species x Denisty	0.23	1.06	0.87	0.80
Species x Biofertilizer	N.S	N.S	N.S	N.S
Denisty x Biofertilizer	N.S	1.36	N.S	N.S
Species x Denisty x Biofertilizer	N.S	N.S	N.S	N.S

Table (5): Effect of biofertilizer and denisty on fresh weight g / plant of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species Sp1	Spring 2005 Species Sp2	Mean	Autumn 2005 Species Sp1	Autumn 2005 Species Sp2	Mean	Spring 2006 Species Sp1	Spring 2006 Species Sp2	Mean	Autumn 2006 Species Sp1	Autumn 2006 Species Sp2	Mean
Control	2 m	71.84	64.76	68.30	632.40	605.69	619.05	988.78	942.26	965.52	904.62	874.37	889.50
	3 m	77.91	73.41	75.66	703.32	664.8	684.06	1088.31	1026.08	1057.20	968.39	934.62	951.51
	4 m	77.93	71.60	74.77	664.98	625.27	645.13	1045.54	977.41	1011.48	936.86	899.59	918.23
	Mean	75.89	69.92	72.91	666.90	631.92	649.41	1040.88	981.917	1011.40	936.623	902.86	919.74
Rhizobium	2 m	74.89	69.67	72.28	683.42	647.02	665.22	1055.57	1024.64	1040.11	944.68	929.58	937.13
	3 m	83.45	82.52	82.99	794.32	742.44	768.38	1185.76	1109.46	1147.61	1030.48	989.21	1009.85
	4 m	87.05	78.06	82.56	757.11	703.47	730.29	1119.16	1062.41	1090.79	1001.59	946.38	973.99
	Mean	81.80	76.75	79.27	744.95	697.64	721.30	1120.16	1065.50	1092.83	992.25	955.06	973.65
Rhizobium + Azospirillum	2 m	78.80	75.27	77.04	721.97	687.72	704.85	1111.61	1074.12	1092.87	1004.37	972.30	988.34
	3 m	89.98	89.42	89.70	849.80	810.32	830.06	1220.73	1160.48	1190.61	1072.43	1037.84	1055.14
	4 m	93.82	84.85	89.34	801.88	759.06	780.47	1156.15	1107.97	1132.06	1029.18	1002.24	1015.71
	Mean	87.53	83.18	85.36	791.22	752.37	771.79	1162.83	1114.19	1138.51	1035.33	1004.13	1019.73
Rhizobium + Azotobacter	2 m	81.66	79.42	80.54	758.26	722.38	740.32	1148.29	1122.42	1135.36	1048.09	1024.71	1036.40
	3 m	93.73	92.07	92.90	899.40	872.07	885.74	1253.49	1187.28	1220.39	1125.51	1089.79	1107.65
	4 m	96.02	89.54	92.78	848.08	812.17	830.13	1198.43	1158.67	1178.55	1077.48	1058.93	1068.21
	Mean	90.47	87.01	88.74	835.25	802.21	818.73	1200.07	1156.12	1178.10	1083.69	1057.81	1070.75
Over all means of denisty	2 m	76.80	72.28	74.54	699.01	665.70	682.36	1076.06	1040.86	1058.46	975.44	950.24	962.84
	3 m	86.27	84.36	85.31	811.71	772.41	792.06	1187.07	1120.83	1153.95	1049.20	1012.87	1031.03
	4 m	88.71	81.01	84.86	768.01	724.99	746.50	1129.82	1076.62	1103.22	1011.28	976.79	994.03
General means		83.92	79.22	81.60	759.58	721.03	740.31	1130.99	1079.43	1105.21	1011.97	979.96	995.97

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	2.53	14.17	9.45	10.91
Denisty	1.49	5.54	6.86	9.48
Biofertilizer	1.74	6.45	5.48	8.59
Species x Denisty	2.15	N.S	9.88	N.S
Species x Biofertilizer	N.S	N.S	N.S	N.S
Denisty x Biofertilizer	N.S	11.18	N.S	N.S
Species x Denisty x Biofertilizer	N.S	N.S	N.S	N.S

Table (6): Effect of biofertilizer and denisty on dry weight g / plant of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species Sp1	Spring 2005 Species Sp2	Mean	Autumn 2005 Species Sp1	Autumn 2005 Species Sp2	Mean	Spring 2006 Species Sp1	Spring 2006 Species Sp2	Mean	Autumn 2006 Species Sp1	Autumn 2006 Species Sp2	Mean
Control	2 m	22.64	20.20	21.42	210.32	201.74	206.03	344.47	328.68	336.58	326.48	312.44	319.46
	3 m	24.58	23.14	23.86	234.74	222.17	228.46	383.87	357.36	370.62	322.38	337.03	329.71
	4 m	24.66	22.42	23.54	220.35	208.55	214.45	366.85	340.19	353.52	339.39	322.94	331.17
	Mean	23.96	21.92	22.94	221.80	210.82	216.31	365.06	342.08	353.57	329.42	324.14	326.78
Rhizobium	2 m	23.88	22.03	22.96	233.55	221.21	227.38	371.83	361.61	366.72	342.70	337.09	339.90
	3 m	26.48	26.38	26.43	274.33	255.29	264.81	422.62	392.49	407.56	382.99	360.82	371.91
	4 m	27.94	24.81	26.38	260.39	245.64	253.02	396.80	374.34	385.57	365.80	344.89	355.35
	Mean	26.10	24.41	25.25	256.09	240.713	248.40	397.08	376.15	386.62	363.83	347.60	355.72
Rhizobium + Azospirillum	2 m	25.35	24.16	24.76	246.59	235.50	241.05	392.88	378.64	385.76	365.30	353.90	359.60
	3 m	28.61	28.56	28.59	292.85	278.77	285.81	435.73	410.78	423.26	392.13	379.11	385.62
	4 m	30.14	26.86	28.50	275.77	260.39	268.08	410.26	391.53	400.90	376.66	365.87	371.27
	Mean	28.03	26.53	27.28	271.74	258.22	264.98	412.96	393.65	403.30	378.03	366.29	372.16
Rhizobium + Azotobacter	2 m	26.45	25.71	26.08	260.97	247.47	254.22	406.01	395.98	401.00	382.24	372.38	377.31
	3 m	30.11	29.72	29.92	310.31	300.59	305.45	447.85	421.44	434.65	413.47	399.17	406.32
	4 m	31.02	28.72	29.87	291.94	279.36	285.65	426.49	409.93	418.21	395.43	386.61	391.02
	Mean	29.19	28.05	28.62	287.74	275.81	281.77	426.78	409.12	417.95	397.05	386.05	391.55
Over all means of denisty	2 m	24.58	23.03	23.80	237.86	226.48	232.17	378.80	366.23	372.51	354.18	343.95	349.07
	3 m	27.45	26.95	27.20	278.06	264.21	271.13	422.52	395.52	409.02	377.74	369.03	373.39
	4 m	28.44	25.70	27.07	262.11	248.49	255.30	400.10	379.00	389.55	369.32	355.08	362.20
General means		26.82	25.23	26.02	259.34	246.39	252.87	400.47	380.25	390.36	367.08	356.02	361.55

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	0.24	2.75	N.S	10.06
Denisty	0.33	1.41	N.S	8.22
Biofertilizer	0.50	1.78	43.03	6.48
Species x Denisty	0.48	N.S	N.S	N.S
Species x Biofertilizer	N.S	N.S	N.S	N.S
Denisty x Biofertilizer	N.S	3.02	N.S	N.S
Species x Denisty x Biofertilizer	N.S	N.S	N.S	N.S

Table (7): Effect of biofertilizer and denisty on fresh yield kg / fed of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species		Mean	Autumn 2005 Species		Mean	Spring 2006 Species		Mean	Autumn 2006 Species		Mean
		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2	
Control	2 m	75.42	67.98	71.70	664.02	635.97	650.00	1038.20	989.37	1013.80	949.85	918.09	933.97
	3 m	54.53	51.40	52.97	492.32	465.36	478.84	761.82	718.26	740.04	677.88	654.23	666.06
	4 m	40.91	37.58	39.25	349.12	328.26	338.69	548.9	513.14	531.02	491.85	472.29	482.07
	Mean	56.953	52.32	54.64	501.82	476.53	489.18	782.98	740.26	761.62	706.53	681.54	694.03
Rhizobium	2 m	78.63	73.16	75.90	717.59	679.37	698.48	1108.40	1075.90	1092.10	991.91	976.06	983.99
	3 m	58.41	57.77	58.09	556.03	519.71	537.87	830.03	776.63	803.33	721.34	692.46	706.90
	4 m	45.70	40.98	43.34	397.49	369.32	383.41	587.55	557.76	572.66	525.83	496.85	511.34
	Mean	60.91	57.30	59.11	557.04	522.80	539.92	841.98	803.42	822.70	746.36	721.79	734.08
Rhizobium + Azospirillum	2 m	82.74	79.03	80.89	758.08	722.11	740.10	1167.20	1127.80	1147.50	1054.60	1020.90	1037.80
	3 m	63.00	62.60	62.80	594.86	567.23	581.05	854.52	812.34	833.43	750.71	726.49	738.60
	4 m	49.25	44.54	46.90	420.99	398.51	409.75	606.97	581.69	594.33	540.32	526.17	533.25
	Mean	65.00	62.06	63.53	591.31	562.62	576.96	876.23	840.62	858.42	781.88	757.86	769.87
Rhizobium + Azotobacter	2 m	85.74	83.39	84.57	796.17	758.49	777.33	1205.70	1178.60	1192.10	1100.50	1076.00	1088.20
	3 m	65.62	64.46	65.04	629.59	610.46	620.03	877.44	831.10	854.27	787.86	762.86	775.36
	4 m	50.41	47.01	48.71	445.24	426.39	435.82	629.17	608.30	618.74	565.67	555.94	560.81
	Mean	67.26	64.95	66.11	623.67	598.45	611.06	904.10	872.65	888.38	818.01	798.25	808.13
Over all means of denisty	2 m	80.63	75.89	78.26	733.97	698.99	716.48	1129.90	1092.90	1111.40	1024.20	997.75	1011.00
	3 m	60.39	59.06	59.72	568.20	540.69	554.45	830.95	784.58	807.77	734.45	709.01	721.73
	4 m	46.57	42.53	44.55	403.21	380.62	391.92	593.15	565.22	579.19	530.92	512.81	521.87
General means		62.53	59.16	60.84	568.46	540.10	554.28	851.32	814.24	832.78	763.19	739.86	751.53

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	2.74	4.13	15.31	16.45
Denisty	1.92	13.75	17.74	16.83
Biofertilizer	1.79	4.54	8.16	8.33
Species x Denisty	2.77	N.S	N.S	N.S
Species x Biofertilizer	N.S	6.42	N.S	N.S
Denisty x Biofertilizer	N.S	7.78	14 14	14.44
Species x Denisty x Biofertilizer	N.S	N.S	N.S	N.S

Table (8): Effect of biofertilizer and denisty on dry yield kg / fed of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species		Mean	Autumn 2005 Species		Mean	Spring 2006 Species		Mean	Autumn 2006 Species		Mean
		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2	
Control	2 m	23.77	21.21	22.49	220.84	211.83	216.34	361.69	345.11	353.40	342.81	328.06	335.44
	3 m	17.21	16.20	16.71	164.32	155.52	159.92	268.71	250.16	259.44	225.67	235.93	230.80
	4 m	12.95	11.78	12.37	115.67	109.49	112.58	192.60	178.60	185.60	178.18	169.54	173.86
	Mean	17.98	16.40	17.19	166.94	158.95	162.95	274.33	257.96	266.15	248.89	244.51	246.70
Rhizobium	2 m	25.08	23.14	24.11	245.24	232.27	238.76	390.42	379.69	385.06	359.84	353.94	356.89
	3 m	18.54	18.47	18.51	192.03	178.70	185.37	295.83	274.74	285.29	268.09	252.57	260.33
	4 m	14.67	13.03	13.85	136.71	128.96	132.84	208.32	196.53	202.43	192.05	181.07	186.56
	Mean	19.43	18.21	18.82	191.33	179.98	185.65	298.19	283.65	290.92	273.33	262.53	267.93
Rhizobium + Azospirillum	2 m	26.62	25.37	26.00	258.93	247.27	253.10	412.53	397.57	405.05	383.58	371.60	377.59
	3 m	20.03	20.00	20.02	205.00	195.14	200.07	305.01	287.56	296.29	274.50	265.39	269.95
	4 m	15.83	14.11	14.97	144.78	136.71	140.75	215.39	205.56	210.48	197.75	192.08	194.92
	Mean	20.83	19.83	20.33	202.90	193.04	197.97	310.98	296.90	303.94	285.28	276.36	280.82
Rhizobium + Azotobacter	2 m	27.77	27.00	27.39	274.03	259.84	266.94	426.31	415.78	421.05	401.36	391.00	396.18
	3 m	21.08	20.80	20.94	217.22	210.41	213.82	313.50	295.01	304.26	289.43	279.42	284.43
	4 m	16.28	15.08	15.68	153.26	146.66	149.96	223.91	215.21	219.56	207.60	202.97	205.29
	Mean	21.71	20.96	21.34	214.84	205.64	210.24	321.24	308.67	314.95	299.46	291.13	295.30
Over all means of denisty	2 m	25.81	24.18	25.00	249.76	237.80	243.78	397.74	384.54	391.14	371.90	361.15	366.52
	3 m	19.22	18.87	19.04	194.64	184.94	189.79	295.76	276.87	286.32	264.42	258.33	261.38
	4 m	14.93	13.50	14.22	137.61	130.46	134.03	210.06	198.98	204.52	193.90	186.42	190.16
General means		19.99	18.85	19.42	194.00	184.40	189.20	301.19	286.79	293.99	276.74	268.63	272.68

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	0.08	10.22	2.44	6.79
Denisty	0.20	8.44	5.53	7.84
Biofertilizer	0.37	12.74	2.86	4.54
Species x Denisty	0.29	N.S	N.S	N.S
Species x Biofertilizer	N.S	N.S	N.S	N.S
Denisty x Biofertilizer	0.64	N.S	4.94	7.87
Species x Denisty x Biofertilizer	N.S	N.S	N.S	N.S

Table (9): Effect of biofertilizer and denisty on crude protein % of leaves of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species		Mean	Autumn 2005 Species		Mean	Spring 2006 Species		Mean	Autumn 2006 Species		Mean
		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2	
Control	2 m	13.42	13.11	13.26	14.68	14.61	14.65	14.11	14.06	14.08	13.66	13.24	13.45
	3 m	13.88	13.27	13.57	15.04	14.85	14.95	14.73	14.57	14.65	14.18	13.77	13.98
	4 m	13.58	13.55	13.57	14.81	14.72	14.77	14.59	14.40	14.50	13.86	13.59	13.73
	Mean	13.63	13.31	13.47	14.85	14.73	14.79	14.48	14.34	14.41	13.90	13.53	13.72
Rhizobium	2 m	13.94	13.48	13.71	15.12	14.89	15.01	14.24	14.32	14.28	14.19	13.78	13.99
	3 m	14.42	13.79	14.10	15.43	15.26	15.34	14.89	14.77	14.83	14.54	14.36	14.45
	4 m	14.34	14.19	14.26	15.25	15.16	15.20	14.78	14.49	14.64	14.48	14.30	14.39
	Mean	14.23	13.82	14.02	15.27	15.10	15.18	14.64	14.53	14.58	14.40	14.15	14.28
Rhizobium + Azospirillum	2 m	14.34	13.85	14.09	15.31	15.22	15.27	14.40	14.59	14.50	14.48	14.06	14.27
	3 m	14.71	14.14	14.42	15.60	15.44	15.52	15.08	14.95	15.02	14.83	14.64	14.74
	4 m	14.60	14.50	14.55	15.43	15.35	15.39	15.06	14.68	14.87	14.85	14.60	14.73
	Mean	14.55	14.16	14.36	15.45	15.34	15.39	14.85	14.74	14.79	14.72	14.43	14.58
Rhizobium + Azotobacter	2 m	14.60	14.38	14.49	15.43	15.33	15.38	14.56	14.81	14.69	14.77	14.45	14.61
	3 m	15.01	14.59	14.80	15.75	15.66	15.71	15.23	15.10	15.17	15.12	14.95	15.03
	4 m	14.85	14.80	14.83	15.53	15.43	15.48	15.18	14.86	15.02	15.01	14.90	14.96
	Mean	14.82	14.59	14.71	15.57	15.47	15.52	14.99	14.92	14.96	14.97	14.77	14.87
Over all means of denisty	2 m	14.07	13.71	13.89	15.14	15.01	15.08	14.33	14.44	14.39	14.28	13.88	14.08
	3 m	14.50	13.95	14.23	15.46	15.30	15.38	14.98	14.85	14.92	14.67	14.43	14.55
	4 m	14.34	14.26	14.30	15.26	15.16	15.21	14.90	14.61	14.76	14.55	14.35	14.45
General means		14.31	13.97	14.14	15.28	15.16	15.22	14.74	14.63	14.69	14.50	14.22	14.36

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	0.20	0.08	0.02	0.10
Denisty	0.07	0.03	0.01	0.08
Biofertilizer	0.10	0.04	0.01	0.08
Species x Denisty	0.10	N.S	0.02	N.S
Species x Biofertilizer	N.S	N.S	0.01	N.S
Denisty x Biofertilizer	N.S	N.S	0.01	0.14
Species x Denisty x Biofertilizer	N.S	N.S	0.02	N.S

Table (10): Effect of biofertilizer and denisty on crude protein % of branches of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species		Mean	Autumn 2005 Species		Mean	Spring 2006 Species		Mean	Autumn 2006 Species		Mean
		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2	
Control	2 m	10.23	10.13	10.18	12.29	11.87	12.08	12.13	11.71	11.92	11.50	11.26	11.38
	3 m	10.93	10.34	10.64	12.72	12.19	12.46	12.53	12.06	12.30	11.91	11.65	11.78
	4 m	10.67	10.61	10.64	12.77	12.00	12.39	12.44	11.93	12.18	11.62	11.44	11.53
	Mean	10.61	10.36	10.49	12.59	12.02	12.31	12.37	11.90	12.13	11.68	11.45	11.56
Rhizobium	2 m	10.78	10.39	10.59	12.48	12.29	12.39	12.31	12.19	12.25	11.68	11.50	11.59
	3 m	11.39	10.81	11.10	12.91	12.72	12.82	12.90	12.56	12.73	12.18	11.87	12.03
	4 m	11.26	11.13	11.20	12.78	12.39	12.59	12.65	12.27	12.46	11.87	11.71	11.79
	Mean	11.15	10.78	19.96	12.73	12.47	12.60	12.62	12.34	12.48	11.91	11.69	11.80
Rhizobium + Azospirillum	2 m	11.17	11.01	11.09	12.64	12.48	12.56	12.47	12.31	12.39	11.86	11.70	11.78
	3 m	11.77	11.34	11.56	13.28	12.86	13.07	12.84	12.67	12.76	12.39	12.14	12.26
	4 m	11.52	11.60	11.56	13.09	12.65	12.87	12.88	12.40	12.67	12.14	11.90	12.02
	Mean	11.49	11.32	11.40	13.00	12.66	12.83	12.73	12.48	12.61	12.13	11.91	12.02
Rhizobium + Azotobacter	2 m	11.54	11.31	11.43	12.89	12.69	12.79	12.65	12.47	12.56	12.07	11.84	11.96
	3 m	12.02	11.53	11.77	13.45	13.00	13.23	13.32	12.89	13.10	12.50	12.27	12.39
	4 m	11.85	11.75	11.80	13.27	12.84	13.05	13.05	12.67	12.86	12.28	12.12	12.20
	Mean	11.80	11.53	11.67	13.20	12.84	13.02	13.01	12.60	12.84	12.28	12.08	12.18
Over all means of denisty	2 m	10.93	10.71	10.82	12.58	12.33	12.45	12.39	12.17	12.28	11.78	11.58	11.68
	3 m	11.53	11.00	11.27	13.09	12.69	12.89	12.90	12.54	12.72	12.25	11.98	12.12
	4 m	11.32	11.27	11.30	12.98	12.47	12.73	12.76	12.33	12.54	11.98	11.79	11.88
General means		11.26	11.00	11.13	12.88	12.50	12.69	12.68	12.35	12.52	12.00	11.78	11.89

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	N.S	0.05	0.10	0.03
Denisty	0.12	0.05	0.09	0.03
Biofertilizer	0.12	0.03	0.09	0.02
Species x Denisty	0.17	0.07	N.S	0.04
Species x Biofertilizer	N.S	0.04	N.S	N.S
Denisty x Biofertilizer	N.S	0.05	N.S	0.03
Species x Denisty x Biofertilizer	N.S	0.07	N.S	0.05

Table (11): Effect of biofertilizer and denisty on crude fiber % of leaves of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species Sp1	Spring 2005 Species Sp2	Mean	Autumn 2005 Species Sp1	Autumn 2005 Species Sp2	Mean	Spring 2006 Species Sp1	Spring 2006 Species Sp2	Mean	Autumn 2006 Species Sp1	Autumn 2006 Species Sp2	Mean
Control	2 m	21.60	23.59	22.60	25.19	25.61	25.40	25.77	26.01	25.89	25.77	26.58	26.17
	3 m	22.62	24.04	23.33	24.94	25.45	25.20	25.38	25.75	25.56	25.38	26.19	25.78
	4 m	23.43	24.90	24.16	25.38	25.73	25.56	25.64	25.87	25.76	25.64	26.53	26.08
	Mean	22.55	24.18	23.36	25.17	25.60	25.38	25.59	25.88	25.74	25.59	26.43	26.01
Rhizobium	2 m	21.18	23.03	22.11	24.95	25.40	25.18	25.54	25.87	25.71	25.54	26.44	25.99
	3 m	21.92	23.73	22.82	24.62	25.25	24.94	25.08	25.59	25.34	25.08	25.90	25.49
	4 m	22.80	24.14	23.47	25.16	25.47	25.31	25.52	25.75	25.64	25.52	26.32	25.92
	Mean	21.97	23.63	22.80	24.91	25.37	25.14	25.38	25.74	25.56	25.38	26.22	25.80
Rhizobium + Azospirillum	2 m	20.95	22.78	21.86	24.54	24.87	24.70	25.35	25.68	25.52	25.35	26.30	25.83
	3 m	21.57	23.41	22.49	24.39	24.72	24.56	24.84	25.33	25.09	24.84	25.75	25.30
	4 m	22.54	23.93	23.24	24.80	24.97	24.88	25.19	25.53	25.36	25.19	26.11	25.65
	Mean	21.69	23.38	22.53	24.57	24.85	24.71	25.13	25.51	25.32	25.13	26.05	25.59
Rhizobium + Azotobacter	2 m	20.44	22.58	21.51	24.28	24.54	24.41	25.10	25.26	25.18	25.10	26.16	25.63
	3 m	21.21	22.69	21.95	24.01	24.41	24.21	24.56	25.00	24.78	24.56	25.64	25.10
	4 m	21.92	23.30	22.61	24.47	24.69	24.58	24.91	25.13	25.02	24.91	25.84	25.37
	Mean	21.19	22.86	22.03	24.25	24.55	24.40	24.86	25.13	24.99	24.86	25.88	25.37
Over all means of denisty	2 m	21.04	22.99	22.02	24.74	25.11	24.92	25.44	25.71	25.57	25.44	26.37	25.90
	3 m	21.83	23.47	22.65	24.49	24.96	24.72	24.97	25.42	25.19	24.97	25.87	25.42
	4 m	22.68	24.07	23.37	24.95	25.22	25.08	25.32	25.57	25.44	25.32	26.20	25.76
General means		21.85	23.51	22.68	24.73	25.09	24.91	25.24	25.57	25.40	25.24	26.15	25.69

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	1.32	0.08	0.07	0.03
Denisty	0.86	0.03	0.03	0.05
Biofertilizer	0.76	0.04	0.05	0.04
Species x Denisty	N.S	0.05	0.05	N.S
Species x Biofertilizer	N.S	0.05	N.S	0.06
Denisty x Biofertilizer	N.S	N.S	N.S	0.07
Species x Denisty x Biofertilizer	N.S	N.S	N.S	N.S

Table (12): Effect of biofertilizer and denisty on crude fiber % of branches of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species		Mean	Autumn 2005 Species		Mean	Spring 2006 Species		Mean	Autumn 2006 Species		Mean
		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2	
Control	2 m	28.39	29.13	28.76	31.33	31.54	31.44	31.65	31.91	31.78	32.73	32.93	32.83
	3 m	28.57	29.27	28.92	31.08	31.35	31.22	31.46	31.68	31.57	32.37	32.59	32.48
	4 m	28.78	29.71	29.25	31.49	31.76	31.62	31.57	31.81	31.69	32.46	32.79	32.63
	Mean	28.58	29.37	28.98	31.30	31.55	31.42	31.56	31.80	31.68	32.52	32.77	32.64
Rhizobium	2 m	28.01	28.30	28.15	31.17	31.38	31.27	31.52	31.76	31.64	32.45	32.74	32.60
	3 m	28.35	28.52	28.44	30.66	31.22	30.94	31.26	31.51	31.39	32.04	32.43	32.24
	4 m	28.63	28.93	28.78	31.39	31.59	31.49	31.49	31.70	31.59	32.34	32.60	32.47
	Mean	28.33	28.58	28.46	31.07	31.39	31.23	31.42	31.66	31.54	32.28	32.59	32.43
Rhizobium + Azospirillum	2 m	27.46	27.86	27.66	30.88	31.17	31.03	31.39	31.66	31.53	32.19	32.47	32.33
	3 m	27.67	28.02	27.85	30.38	31.03	30.70	30.93	31.42	31.18	31.65	32.21	31.93
	4 m	27.84	28.36	28.10	31.24	31.36	31.30	31.31	31.56	31.43	32.06	32.35	32.21
	Mean	27.66	28.08	27.87	30.83	31.19	31.01	31.21	31.55	31.38	31.97	32.35	32.16
Rhizobium + Azotobacter	2 m	27.19	27.26	27.23	30.72	31.00	30.86	31.13	31.50	31.32	31.87	32.18	32.03
	3 m	27.47	27.65	27.56	30.24	30.86	30.55	30.66	31.27	30.96	31.40	31.93	31.60
	4 m	27.68	28.01	27.85	30.87	31.06	30.97	30.98	31.36	31.17	31.71	32.06	31.89
	Mean	27.45	27.64	27.54	30.61	30.97	30.79	30.92	31.38	31.15	31.66	32.06	31.86
Over all means of denisty	2 m	27.76	28.14	27.95	31.03	31.27	31.15	31.42	31.71	31.57	32.31	32.58	32.44
	3 m	28.02	28.37	28.19	30.59	31.11	30.85	31.08	31.47	31.27	31.86	32.29	32.08
	4 m	28.24	28.75	28.49	31.25	31.44	31.35	31.34	31.61	31.47	32.14	32.45	32.30
General means		28.01	28.42	28.21	30.96	31.28	31.12	31.28	31.60	31.44	32.11	32.44	32.27

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	0.09	0.12	0.02	0.07
Denisty	0.22	0.04	0.05	0.02
Biofertilizer	0.25	0.03	0.03	0.03
Species x Denisty	N.S	0.06	0.07	0.08
Species x Biofertilizer	N.S	0.05	0.05	0.05
Denisty x Biofertilizer	N.S	0.06	0.06	N.S
Species x Denisty x Biofertilizer	N.S	0.08	0.08	0.08

Table (13): Effect of biofertilizer and denisty on total carbohydrate % of leaves of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species		Mean	Autumn 2005 Species		Mean	Spring 2006 Species		Mean	Autumn 2006 Species		Mean
		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2	
Control	2 m	42.06	41.58	**41.82**	43.01	42.85	**42.93**	43.42	43.47	**43.45**	44.44	44.08	**44.26**
	3 m	42.53	41.95	**42.24**	43.22	43.11	**43.17**	43.89	43.66	**43.78**	44.62	44.23	**44.43**
	4 m	42.91	42.19	**42.55**	43.51	43.42	**43.47**	44.11	43.91	**44.01**	45.00	44.63	**44.81**
	Mean	**42.50**	**41.91**	42.20	43.25	43.13	43.19	**43.81**	**43.68**	43.74	**44.69**	**44.31**	44.50
Rhizobium	2 m	42.49	42.30	**42.40**	43.38	43.18	**43.28**	43.75	43.76	**43.76**	44.74	44.31	**44.53**
	3 m	43.05	43.03	**43.04**	43.44	43.32	**43.38**	44.16	43.88	**44.02**	44.86	44.40	**44.63**
	4 m	43.54	43.31	**43.43**	43.72	43.56	**43.64**	44.28	44.13	**44.21**	45.27	44.80	**45.04**
	Mean	**43.03**	**42.88**	42.95	43.51	43.36	43.44	**44.06**	**43.92**	43.99	**44.96**	**44.50**	44.73
Rhizobium + Azospirillum	2 m	42.83	43.00	**42.91**	43.64	43.48	**43.56**	43.99	44.20	**44.09**	44.92	44.68	**44.80**
	3 m	43.48	43.26	**43.37**	43.68	43.56	**43.62**	44.38	44.26	**44.32**	45.12	44.62	**44.87**
	4 m	44.05	43.54	**43.80**	43.83	43.70	**43.77**	44.56	44.39	**44.47**	45.48	45.07	**45.28**
	Mean	**43.45**	**43.27**	43.36	43.72	43.58	43.65	**44.31**	**44.28**	44.30	**45.17**	**44.79**	44.98
Rhizobium + Azotobacter	2 m	43.90	43.52	**43.71**	44.16	44.02	**44.09**	44.34	44.28	**44.31**	45.17	44.82	**45.00**
	3 m	44.21	43.87	**44.04**	44.20	44.06	**44.13**	44.58	44.46	**44.52**	45.35	45.00	**45.18**
	4 m	44.42	44.12	**44.27**	44.30	44.23	**44.27**	44.73	44.58	**44.66**	45.63	45.30	**45.47**
	Mean	**44.18**	**43.84**	44.01	44.22	44.10	44.16	**44.55**	**44.44**	44.49	**45.39**	**45.04**	45.21
Over all means of denisty	2 m	42.82	42.60	**42.71**	43.55	43.38	**43.47**	43.87	43.93	**43.90**	44.82	44.47	**44.65**
	3 m	43.32	43.03	**43.17**	43.64	43.51	**43.58**	44.25	44.06	**44.16**	44.99	44.56	**44.78**
	4 m	43.73	43.29	**43.51**	43.84	43.73	**43.79**	44.42	44.25	**44.34**	45.34	44.95	**45.15**
General means		**43.29**	**42.97**	**43.13**	**43.68**	**43.54**	43.61	**44.18**	**44.08**	**44.13**	**45.05**	**44.66**	**44.86**

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	0.28	0.09	0.03	0.09
Denisty	0.20	0.03	0.03	0.02
Biofertilizer	0.21	0.03	0.03	0.03
Species x Denisty	N.S	N.S	0.04	0.04
Species x Biofertilizer	N.S	N.S	0.04	0.04
Denisty x Biofertilizer	N.S	0.05	0.05	0.05
Species x Denisty x Biofertilizer	N.S	N.S	0.07	0.07

Table (14): Effect of biofertilizer and denisty on total carbohydrate % of branches of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species		Mean	Autumn 2005 Species		Mean	Spring 2006 Species		Mean	Autumn 2006 Species		Mean
		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2	
Control	2 m	36.38	34.88	**35.63**	37.67	37.41	**37.54**	38.15	37.95	**38.05**	38.92	38.84	**38.88**
	3 m	36.88	35.25	**36.07**	37.99	37.58	**37.79**	38.53	38.07	**38.30**	39.66	39.15	**39.40**
	4 m	37.22	35.43	**36.32**	38.03	37.80	**37.92**	38.73	38.23	**38.48**	39.78	39.61	**39.69**
	Mean	**36.82**	**35.19**	**36.01**	37.90	37.60	37.75	**38.47**	**38.09**	**38.28**	**39.45**	**39.20**	**39.32**
Rhizobium	2 m	36.88	35.80	**36.34**	37.86	37.84	**37.85**	38.62	38.16	**38.39**	39.24	39.12	**39.18**
	3 m	37.22	35.74	**36.48**	38.27	38.08	**38.17**	38.79	38.38	**38.58**	39.81	39.58	**39.69**
	4 m	37.59	36.90	**37.25**	38.51	38.32	**38.42**	38.95	38.57	**38.76**	40.19	39.86	**40.03**
	Mean	**37.23**	**36.15**	**36.69**	38.21	38.08	38.15	**38.79**	**38.37**	**38.58**	**39.75**	**39.52**	**39.63**
Rhizobium + Azospirillum	2 m	37.07	36.05	**36.56**	38.14	37.95	**38.04**	38.89	38.30	**38.59**	39.35	39.39	**39.37**
	3 m	37.53	36.03	**36.78**	38.41	38.25	**38.33**	39.01	38.57	**38.79**	40.07	39.83	**39.95**
	4 m	37.83	37.30	**37.56**	38.68	38.55	**38.62**	39.17	38.86	**39.02**	40.37	40.17	**40.27**
	Mean	**37.48**	**36.46**	**36.97**	38.41	38.25	38.33	**39.02**	**38.57**	**38.80**	**39.93**	**39.80**	**39.86**
Rhizobium + Azotobacter	2 m	37.28	36.61	**36.94**	38.44	38.17	**38.31**	39.10	38.48	**38.79**	39.59	39.65	**39.62**
	3 m	37.79	37.64	**37.71**	38.56	38.43	**38.50**	39.25	38.70	**38.98**	40.36	40.05	**40.21**
	4 m	38.12	37.92	**38.02**	38.81	38.63	**38.72**	39.42	39.03	**39.23**	40.64	40.29	**40.46**
	Mean	**37.73**	**37.39**	**37.56**	**38.60**	**38.41**	38.51	**39.26**	**38.74**	**39.00**	**40.20**	**40.00**	**40.10**
Over all means of denisty	2 m	36.90	35.83	**36.37**	38.03	37.84	37.93	38.69	38.22	**38.46**	39.27	39.25	**39.26**
	3 m	37.35	36.17	**36.76**	38.31	38.09	38.20	38.90	38.43	**38.66**	39.98	39.65	**39.81**
	4 m	37.69	36.89	**37.29**	38.51	38.33	38.42	39.07	38.67	**38.87**	40.24	39.98	**40.11**
General means		**37.31**	**36.30**	**36.81**	38.28	38.09	38.18	**38.88**	**38.44**	38.66	**39.83**	**39.63**	**39.73**

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	0.92	0.05	0.14	0.14
Denisty	0.15	0.03	0.07	0.04
Biofertilizer	0.23	0.03	0.04	0.05
Species x Denisty	N.S	N.S	N.S	0.06
Species x Biofertilizer	0.33	0.04	0.05	N.S
Denisty x Biofertilizer	N.S	0.05	N.S	N.S
Species x Denisty x Biofertilizer	N.S	0.76	0.09	0.12

Table (15): Effect of biofertilizer and denisty on total ash % of leaves of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species		Mean	Autumn 2005 Species		Mean	Spring 2006 Species		Mean	Autumn 2006 Species		Mean
		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2	
Control	2 m	13.99	15.32	**14.66**	17.47	17.62	**17.55**	15.29	15.59	**15.44**	16.07	16.55	**16.31**
	3 m	13.72	14.68	**14.20**	17.03	17.22	**17.13**	14.89	15.13	**15.01**	15.49	16.01	**15.75**
	4 m	14.35	14.82	**14.58**	17.30	17.86	**17.58**	15.05	15.38	**15.21**	15.62	16.32	**15.97**
	Mean	**14.02**	**14.94**	**14.48**	17.27	17.57	17.42	**15.08**	**15.37**	**15.22**	**15.72**	**16.30**	**16.01**
Rhizobium	2 m	14.30	15.58	**14.94**	17.56	17.86	**17.71**	15.49	15.70	**15.59**	16.27	16.88	**16.57**
	3 m	14.03	16.11	**15.07**	17.26	17.43	**17.35**	15.05	15.33	**15.19**	15.77	16.15	**15.96**
	4 m	14.81	15.24	**15.03**	17.44	18.04	**17.74**	15.33	15.52	**15.43**	16.01	16.63	**16.32**
	Mean	**14.38**	**15.64**	**15.01**	17.42	17.78	17.60	**15.29**	**15.52**	**15.40**	**16.02**	**16.55**	**16.28**
Rhizobium + Azospirillum	2 m	14.33	16.01	**15.17**	17.68	18.09	**17.88**	15.71	15.87	**15.79**	16.41	17.10	**16.76**
	3 m	14.04	16.43	**15.24**	17.42	17.66	**17.54**	15.28	15.49	**15.39**	16.12	16.48	**16.30**
	4 m	14.51	15.54	**15.03**	17.60	18.33	**17.97**	15.54	15.73	**15.63**	16.25	16.92	**16.58**
	Mean	**14.30**	**15.99**	**15.14**	17.57	18.03	17.80	**15.51**	**15.70**	**15.60**	**16.26**	**16.83**	**16.55**
Rhizobium + Azotobacter	2 m	15.01	16.36	**15.68**	17.89	18.27	**18.08**	15.90	16.07	**15.99**	16.85	17.37	**17.11**
	3 m	14.62	16.64	**15.63**	17.58	17.97	**17.77**	15.53	15.76	**15.65**	16.35	16.77	**16.56**
	4 m	15.33	16.75	**16.04**	17.79	18.43	**18.11**	15.73	15.87	**15.80**	16.65	17.08	**16.87**
	Mean	**14.98**	**16.58**	**15.78**	17.75	**18.22**	17.99	**15.72**	**15.90**	**15.81**	**16.61**	**17.07**	**16.84**
Over all means of denisty	2 m	14.41	15.82	**15.11**	17.65	17.96	**17.81**	15.60	15.81	**15.70**	16.40	16.98	**16.69**
	3 m	14.10	15.97	**15.03**	17.32	17.57	**17.45**	15.19	15.43	**15.31**	15.93	16.35	**16.14**
	4 m	14.75	15.59	**15.17**	17.53	18.17	**17.85**	15.41	15.63	**15.52**	16.13	16.74	**16.43**
General means		**14.42**	**15.79**	**15.11**	17.50	**17.90**	17.70	**15.40**	**15.62**	**15.51**	**16.15**	**16.69**	**16.42**

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	0.80	0.11	0.04	0.02
Denisty	N.S	0.10	0.04	0.04
Biofertilizer	0.39	0.08	0.02	0.04
Species x Denisty	0.47	0.14	N.S	0.06
Species x Biofertilizer	N.S	0.12	0.04	0.05
Denisty x Biofertilizer	N.S	N.S	0.04	0.06
Species x Denisty x Biofertilizer	N.S	N.S	N.S	0.09

Table (16): Effect of biofertilizer and denisty on total ash % of branches of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 - 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species Sp1	Spring 2005 Species Sp2	Mean	Autumn 2005 Species Sp1	Autumn 2005 Species Sp2	Mean	Spring 2006 Species Sp1	Spring 2006 Species Sp2	Mean	Autumn 2006 Species Sp1	Autumn 2006 Species Sp2	Mean
Control	2 m	11.07	10.02	10.55	12.05	13.10	12.58	11.51	11.89	11.70	12.42	13.04	12.73
	3 m	10.56	10.34	10.45	11.71	12.63	12.17	10.87	11.52	11.20	11.68	11.77	11.72
	4 m	10.80	10.28	10.54	11.84	12.87	12.36	11.13	11.71	11.42	12.07	12.13	12.10
	Mean	10.81	10.21	10.51	11.87	12.87	12.37	11.17	11.71	11.44	12.05	12.31	12.18
Rhizobium	2 m	11.89	10.87	11.38	12.31	13.36	12.84	11.67	12.15	11.91	12.61	13.30	12.96
	3 m	11.25	10.68	10.97	11.97	12.83	12.40	11.10	11.70	11.40	11.87	12.03	11.95
	4 m	10.81	10.52	10.67	11.96	13.09	12.52	11.39	11.96	11.68	12.30	12.31	12.31
	Mean	11.32	10.69	11.00	12.08	13.09	12.59	11.39	11.94	11.66	12.26	12.55	12.40
Rhizobium + Azospirillum	2 m	12.39	11.68	12.04	12.44	13.56	13.00	11.85	12.30	12.07	12.81	13.51	13.16
	3 m	11.62	10.96	11.29	12.12	13.12	12.62	11.47	11.89	11.68	12.10	12.23	12.16
	4 m	11.32	10.86	11.09	12.35	13.32	12.84	11.59	12.19	11.89	12.56	12.53	12.55
	Mean	11.78	11.17	11.47	12.30	13.33	12.82	11.64	12.13	11.88	12.49	12.76	12.62
Rhizobium + Azotobacter	2 m	12.92	12.22	12.57	12.59	13.69	13.14	12.01	12.42	12.22	13.05	13.69	13.37
	3 m	11.97	12.24	12.11	12.29	13.34	12.82	11.70	12.13	11.91	12.31	12.63	12.47
	4 m	12.08	11.86	11.97	12.41	13.52	12.97	11.79	12.32	12.06	12.83	12.84	12.83
	Mean	12.33	12.11	12.22	12.43	13.52	12.97	11.83	12.29	12.06	12.73	13.05	12.89
Over all means of denisty	2 m	12.07	11.20	11.63	12.35	13.43	12.89	11.76	12.19	11.98	12.72	13.39	13.05
	3 m	11.35	11.06	11.20	12.02	12.98	12.50	11.29	11.81	11.55	11.99	12.16	12.08
	4 m	11.25	10.88	11.07	12.14	13.20	12.67	11.47	12.05	11.76	12.44	12.45	12.45
General means		11.56	11.05	11.30	12.17	13.20	12.69	11.51	12.02	11.76	12.38	12.67	12.53

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	N.S	0.05	0.07	0.03
Denisty	0.41	0.05	0.03	0.04
Biofertilizer	0.34	0.03	0.02	0.03
Species x Denisty	N.S	N.S	0.05	0.05
Species x Biofertilizer	N.S	0.04	0.03	N.S
Denisty x Biofertilizer	N.S	0.05	0.04	0.05
Species x Denisty x Biofertilizer	N.S	0.07	0.05	0.07

Table (17): Effect of biofertilizer and denisty on total digestible nutrient (TDN) % of leaves of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species		Mean	Autumn 2005 Species		Mean	Spring 2006 Species		Mean	Autumn 2006 Species		Mean
		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2	
Control	2 m	63.36	61.80	62.58	61.18	60.85	61.01	60.56	60.36	60.46	60.40	59.66	60.03
	3 m	62.77	61.52	62.15	61.49	61.05	61.27	61.06	60.73	60.90	60.87	60.13	60.50
	4 m	62.08	61.00	61.54	61.09	60.80	60.94	60.82	60.58	60.70	60.57	59.82	60.19
	Mean	62.74	61.44	62.09	61.25	60.90	61.08	60.81	60.56	60.69	60.61	59.87	60.24
Rhizobium	2 m	63.85	62.34	63.09	61.51	61.10	61.31	60.77	60.55	60.66	60.76	59.95	60.35
	3 m	63.48	61.94	62.71	61.86	61.34	61.60	61.33	60.92	61.13	61.21	60.55	60.88
	4 m	62.80	61.77	62.29	61.40	61.14	61.27	60.97	60.71	60.84	60.87	60.22	60.55
	Mean	63.37	62.01	62.69	61.59	61.19	61.39	61.03	60.73	60.88	60.94	60.24	60.59
Rhizobium + Azospirillum	2 m	64.16	62.65	63.40	61.88	61.60	61.74	60.96	60.79	60.88	60.99	60.15	60.57
	3 m	63.83	62.29	63.06	62.09	61.79	61.94	61.57	61.17	61.37	61.48	60.76	61.12
	4 m	63.08	62.03	62.56	61.73	61.57	61.65	61.31	60.93	61.12	61.24	60.48	60.86
	Mean	63.69	62.32	63.01	61.90	61.65	61.78	61.28	60.96	61.12	61.24	60.46	60.85
Rhizobium + Azotobacter	2 m	64.62	62.98	63.80	62.11	61.88	62.00	61.21	61.17	61.19	61.28	60.39	60.84
	3 m	64.20	62.97	63.59	62.42	62.09	62.26	61.83	61.46	61.65	61.79	60.95	61.37
	4 m	63.62	62.60	63.11	62.01	61.81	61.91	61.56	61.29	61.42	61.50	60.79	61.14
	Mean	64.15	62.85	63.50	62.18	61.93	62.05	61.53	61.31	61.42	61.52	60.71	61.12
Over all means of denisty	2 m	63.99	62.44	63.22	61.67	61.36	61.51	60.87	60.72	60.80	60.86	60.04	60.45
	3 m	63.57	62.18	62.87	61.96	61.57	61.76	61.45	61.07	61.26	61.34	60.60	60.97
	4 m	62.90	61.85	62.37	61.56	61.33	61.44	61.17	60.88	61.02	61.04	60.33	60.69
General means		63.49	62.16	62.82	61.73	61.42	61.57	61.16	60.89	61.03	61.08	60.32	60.70

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	N.S	0.06	0.05	0.03
Denisty	N.S	0.04	0.02	0.03
Biofertilizer	N.S	0.05	0.04	0.03
Species x Denisty	N.S	0.06	0.03	1.02
Species x Biofertilizer	N.S	0.07	N.S	0.05
Denisty x Biofertilizer	N.S	N.S	N.S	0.06
Species x Denisty x Biofertilizer	N.S	N.S	N.S	N.S

Table (18): Effect of biofertilizer and denisty on total digestible nutrient (TDN) % of branches of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species		Mean	Autumn 2005 Species		Mean	Spring 2006 Species		Mean	Autumn 2006 Species		Mean
		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2	
Control	2 m	57.29	56.71	57.00	55.86	55.56	55.71	55.57	55.24	55.40	54.57	54.34	54.45
	3 m	57.40	56.68	57.04	56.20	55.81	56.00	55.85	55.52	55.69	54.97	54.72	54.85
	4 m	57.15	56.45	56.80	55.92	55.44	55.68	55.74	55.38	55.56	54.80	54.50	54.65
	Mean	57.28	56.62	56.95	55.99	55.60	55.80	55.72	55.38	55.55	54.78	54.52	54.65
Rhizobium	2 m	57.76	57.41	57.59	56.05	55.82	55.94	55.73	55.51	55.62	54.83	54.55	54.69
	3 m	57.72	57.39	57.56	56.57	56.10	56.33	56.13	55.82	55.98	55.30	54.91	55.11
	4 m	57.47	57.21	57.34	55.99	55.71	55.85	55.87	55.59	55.73	54.98	54.73	54.85
	Mean	57.65	57.34	57.49	56.20	55.88	56.04	55.91	55.64	55.78	55.04	54.73	54.89
Rhizobium + Azospirillum	2 m	58.29	57.95	58.12	56.31	56.04	56.18	55.88	55.63	55.75	55.08	54.82	54.95
	3 m	58.35	57.94	58.15	56.90	56.28	56.59	56.34	55.93	56.14	55.66	55.16	55.41
	4 m	58.14	57.79	57.96	56.20	55.96	56.08	56.08	55.76	55.92	55.27	54.98	55.13
	Mean	58.26	57.89	58.08	56.47	56.09	56.28	56.10	55.77	55.94	55.34	54.99	55.16
Rhizobium + Azotobacter	2 m	58.62	58.49	58.55	56.51	56.24	56.38	56.13	55.80	55.97	55.39	55.08	55.24
	3 m	58.58	58.28	58.43	57.06	56.46	56.76	56.71	56.12	56.41	55.88	55.42	55.65
	4 m	58.37	58.10	58.23	56.54	56.25	56.39	56.38	56.39	56.39	55.58	55.27	55.42
	Mean	58.52	58.29	58.41	56.70	56.31	56.51	56.41	56.10	56.26	55.62	55.25	55.44
Over all means of denisty	2 m	57.99	57.64	57.81	56.18	55.92	56.05	55.83	55.54	55.69	54.97	54.70	54.83
	3 m	58.01	57.57	57.79	56.68	56.16	56.42	56.26	55.85	56.05	55.46	55.05	55.25
	4 m	57.78	57.39	57.58	56.16	55.84	56.00	56.02	55.78	55.90	55.16	54.87	55.01
General means		57.93	57.53	57.73	56.34	55.97	56.16	56.04	55.72	55.88	55.19	54.87	55.03

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	0.12	0.08	0.10	0.05
Denisty	0.15	0.04	0.07	0.02
Biofertilizer	0.19	0.03	0.07	0.03
Species x Denisty	N.S	0.06	0.09	0.02
Species x Biofertilizer	N.S	N.S	N.S	0.04
Denisty x Biofertilizer	N.S	0.06	0.12	N.S
Species x Denisty x Biofertilizer	N.S	0.08	0.17	0.07

Table (19): Effect of biofertilizer and denisty on digestible protein (DP) % of leaves of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species		Mean	Autumn 2005 Species		Mean	Spring 2006 Species		Mean	Autumn 2006 Species		Mean
		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2		Sp1	Sp2	
Control	2 m	9.32	9.02	9.17	10.54	10.47	10.50	9.99	9.94	9.96	9.56	9.15	9.36
	3 m	9.76	9.17	9.47	10.88	10.70	10.79	10.59	10.43	10.51	10.06	9.66	9.86
	4 m	9.47	9.45	9.46	10.66	10.58	10.62	10.45	10.27	10.36	9.75	9.49	9.62
	Mean	9.52	9.21	9.37	10.70	10.58	10.64	10.34	10.21	10.28	9.79	9.44	9.61
Rhizobium	2 m	9.82	9.38	9.60	10.96	10.74	10.85	10.11	10.19	10.15	10.07	9.67	9.87
	3 m	10.27	9.67	9.97	11.25	11.09	11.17	10.74	10.63	10.68	10.40	10.23	10.32
	4 m	10.20	10.05	10.13	11.08	10.99	11.04	10.64	10.36	10.50	10.35	10.17	10.26
	Mean	10.10	9.70	9.90	11.10	10.94	11.02	10.49	10.39	10.44	10.27	10.03	10.15
Rhizobium + Azospirillum	2 m	10.20	9.73	9.96	11.15	11.05	11.10	10.27	10.45	10.36	10.34	9.94	10.14
	3 m	10.55	10.01	10.28	11.42	11.27	11.35	10.92	10.79	10.86	10.68	10.50	10.59
	4 m	10.45	10.36	10.40	11.26	11.18	11.22	10.90	10.54	10.72	10.70	10.46	10.58
	Mean	10.40	10.03	10.22	11.28	11.17	11.22	10.70	10.60	10.65	10.57	10.30	10.44
Rhizobium + Azotobacter	2 m	10.45	10.24	10.34	11.26	11.16	11.21	10.42	10.66	10.54	10.62	10.32	10.47
	3 m	10.84	10.45	10.65	11.57	11.48	11.52	11.06	10.94	11.00	10.96	10.80	10.88
	4 m	10.69	10.64	10.67	11.35	11.25	11.30	11.01	10.71	10.86	10.86	10.75	10.80
	Mean	10.66	10.44	10.55	11.39	11.30	11.35	10.83	10.77	10.80	10.81	10.62	10.72
Over all means of denisty	2 m	9.94	9.59	9.77	10.98	10.86	10.92	10.20	10.31	10.25	10.15	9.77	9.96
	3 m	10.36	9.83	10.09	11.28	11.13	11.21	10.83	10.70	10.76	10.52	10.30	10.41
	4 m	10.20	10.13	10.16	11.09	11.00	11.05	10.75	10.47	10.61	10.41	10.22	10.32
General means		10.17	9.85	10.01	11.12	11.00	11.06	10.59	10.49	10.54	10.36	10.10	10.23

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	0.19	0.07	0.02	0.03
Denisty	0.07	0.03	0.01	0.02
Biofertilizer	0.09	0.04	0.01	0.01
Species x Denisty	0.10	N.S	0.02	0.02
Species x Biofertilizer	N.S	N.S	0.01	0.02
Denisty x Biofertilizer	N.S	N.S	0.01	0.02
Species x Denisty x Biofertilizer	N.S	N.S	0.02	0.03

Table (20): Effect of biofertilizer and denisty on digestible protein (DP) % of branches of *prosopis chilensis* (Sp1) and *prosopis juliflora* (Sp2) during spring and autumn in 2005 – 2006 seasons.

Biofertilizer	Denisty (m)	Spring 2005 Species Sp1	Spring 2005 Species Sp2	Mean	Autumn 2005 Species Sp1	Autumn 2005 Species Sp2	Mean	Spring 2006 Species Sp1	Spring 2006 Species Sp2	Mean	Autumn 2006 Species Sp1	Autumn 2006 Species Sp2	Mean
Control	2 m	6.26	6.17	6.21	8.24	7.84	8.04	8.09	7.68	7.89	7.49	7.25	7.37
	3 m	6.94	6.37	6.65	8.65	8.15	8.40	8.48	8.02	8.25	7.88	7.63	7.75
	4 m	6.69	6.62	6.65	8.71	7.97	8.34	8.39	7.90	8.14	7.60	7.43	7.52
	Mean	6.63	6.38	6.51	8.53	7.98	8.26	8.32	7.87	8.09	7.66	7.44	7.55
Rhizobium	2 m	6.79	6.42	6.60	8.43	8.24	8.33	8.26	8.14	8.20	7.66	7.48	7.57
	3 m	7.38	6.81	7.09	8.84	8.66	8.75	8.83	8.50	8.67	8.14	7.85	8.00
	4 m	7.25	7.13	7.19	8.71	8.34	8.53	8.59	8.22	8.41	7.84	7.68	7.76
	Mean	7.14	6.78	6.96	8.66	8.41	8.54	8.56	8.29	8.43	7.88	7.67	7.78
Rhizobium + Azospirillum	2 m	7.17	7.01	7.09	8.58	8.43	8.51	8.42	8.27	8.34	7.83	7.68	7.75
	3 m	7.74	7.32	7.53	9.19	8.79	8.99	8.77	8.61	8.69	8.34	8.10	8.22
	4 m	7.50	7.58	7.54	9.01	8.59	8.80	8.81	8.41	8.61	8.10	7.87	7.98
	Mean	7.47	7.30	7.39	8.93	8.60	8.77	8.67	8.43	8.55	8.09	7.88	7.98
Rhizobium + Azotobacter	2 m	7.52	7.30	7.41	8.82	8.62	8.72	8.59	8.42	8.51	8.03	7.82	7.93
	3 m	7.97	7.51	7.74	9.36	8.93	9.14	9.23	8.82	9.02	8.45	8.23	8.34
	4 m	7.81	7.72	7.77	9.18	8.77	8.98	8.97	8.61	8.79	8.23	8.08	8.16
	Mean	7.77	7.51	7.64	9.12	8.77	8.95	8.93	8.61	8.77	8.24	8.04	8.14
Over all means of denisty	2 m	6.93	6.72	6.83	8.52	8.28	8.40	8.34	8.13	8.23	7.75	7.56	7.66
	3 m	7.51	7.00	7.25	9.01	8.63	8.82	8.83	8.49	8.66	8.20	7.95	8.08
	4 m	7.31	7.26	7.29	8.90	8.42	8.66	8.69	8.29	8.49	7.94	7.77	7.85
General means		7.25	7.00	7.12	8.81	8.44	8.63	8.62	8.30	8.46	7.97	7.76	7.86

L.S.D. at 5% for	Spring 2005	Autumn 2005	Spring 2006	Autumn 2006
Species	0.19	0.04	0.10	0.02
Denisty	0.06	0.05	0.08	0.02
Biofertilizer	0.09	0.02	0.09	0.02
Species x Denisty	0.10	0.07	N.S	0.04
Species x Biofertilizer	N.S	0.03	N.S	N.S
Denisty x Biofertilizer	N.S	0.04	N.S	0.03
Species x Denisty x Biofertilizer	N.S	0.06	N.S	0.05

ARABIC SUMMARY

الملخص العربى

أقيمت تجربة حقلية بمحطة بحوث رأس سدر بجنوب سيناء التابعة لمركز بحوث الصحراء خلال موسمى ٢٠٠٥ – ٢٠٠٦ .حيث صممت التجربة بهدف تقدير الصفات الخضرية و الإنتاجية العلفية الغضة و الجافة و كذا تقديرات المكونات الكيماوية لصنفين من البرسوبس.

(*Prosopis chilensis* (Mol.)Stuntz and *Prosopis juliflora* (Sw.) Dc).

وذلك تحت تأثير ثلاثة مسافات (٢ - ٣ - ٤ متر) و اربعة معاملات تسميد حيوى (كنترول – الريزوبيم – الريزوبيم + الازوسبيرليليم – الريزوبيم + الازوتوباكتر) واستخدم تصميم القطع المنشقة مرتين حيث خصصت الأصناف للقطع الرئيسية و المسافات للقطع الشقية الأولى و التسميد الحيوى للقطع الشقية الثانية وذلك بطريقة عشوائية لكل من هذه المعاملات و قد تم الحصول على اربعة حشات خلال موسمى الربيع و الخريف ٢٠٠٥ – ٢٠٠٦. و يمكن تلخيص اهم النتائج المتحصل عليها فيما يلى :

الصفات الخضرية :

- طول النباتات :

١- دلت النتائج على تفوق برسوبس شيلينسس على برسوبس جليفلورا فى طول النبات معنويا خلال جميع مواسم الدراسة (الربيع و الخريف ٢٠٠٥ – ٢٠٠٦).

٢ – الزراعة على مسافة ٣ متر زادت طول النباتات معنويا فى جميع مواسم الدراسة (موسم الخريف ٢٠٠٥ وموسمي الربيع و الخريف ٢٠٠٦) ما عدا خلال موسم الإنشاء (الربيع ٢٠٠٥) كانت مع ٣ متر.

٣ – أدى تلقيح التقاوى بالاسمدة الحيوية الى زيادة متوالية لطول النباتات معنوية من الكنترول حتى وصلت اقصاها مع الريزوبيم + الازوتوباكتر لجميع المواسم.

٤ – تفوق البرسوبس شيلينسس معنويا فى الطول بزراعتة على مسافة ٣ متر و تلقيحة بخليط من الريزوبيم + الازوتوباكتر على برسوبس جليفلورا.

- سمك الساق / نبات :

٥ – أوضحت النتائج تفوق برسوبس شيلينسس على برسوبس جليفلورا فى سمك الساق معنويا فى جميع المواسم المختلفة.

٦ – أدت الزراعة على مسافة ٣ متر بين النباتات الى الحصول على اكبر سمك لساق النباتات بفروق معنوية خلال موسمى الربيع ٢٠٠٥و الخريف ٢٠٠٦. بينما الزراعة على مسافة ٤ متر زادت السمك معنويا لموسمى الخريف ٢٠٠٥ و الربيع ٢٠٠٦).

٧ - أدى تلقيح التقاوى بالاسمدة الحيوية الى زيادة سمك النباتات معنويا حتى وصلت اقصاها مع الريزوبيم + الازوتوباكتر لجميع المواسم.

٨ - أوضحت النتائج تفوق برسوبس شيلينسس على برسوبس جليفلورا فى سمك الساق معنويا على مسافة ٣ متر والتلقيح بالريزوبيم + الازوتوباكتر خلال موسمى الربيع ٢٠٠٥و الخريف ٢٠٠٦).

- بداية نقطة التفريع :

٩- تفوق البرسوبس شيلينسس فى وصولة لاعلى نقطة تفريع عن البرسوبس جليفلورا معنويا فى جميع مواسم الدراسة.

١٠ - أدت الزراعة على مسافة ٢ متر بين النباتات الحصول على أعلى نقطة تفريع معنويا خلال معظم المواسم (موسم الخريف ٢٠٠٥ و موسمي الربيع و الخريف ٢٠٠٦) ما عدا خلال موسم الإنشاء (الربيع ٢٠٠٥) كانت مع ٣ متر.

١١- أظهرت النتائج وجود فروق معنوية لمعاملات التسميد الحيوى أدت للوصول لاعلى نقطة تفريع بالتلقيح بالريزوبيم + الازوتوباكتر.

١٢- دل التفاعل الثلاثى على تفوق معنوى للبرسوبس شيلينسس على برسوبس جليفلورا فى الوصول لأعلى نقطة تفريع على مسافة ٢ متر والتلقيح بالريزوبيم + الازوتوباكتر خلال موسم الخريف ٢٠٠٥ و موسمى الربيع و الخريف ٢٠٠٦.

- عدد الفروع / نبات :

١٣- دلت النتائج على أن البرسوبس شيلينسس كان أكثر عددا للفروع من برسوبس جليفلورا فى جميع المواسم.

١٤- الزراعة على مسافة ٣ متر بين النباتات أدت للحصول على أكبر عدد من الفروع معنويا لجميع المواسم ما عدا لموسم الربيع ٢٠٠٥.

١٥- أظهر التسميد الحيوى وجود فروق معنوية أدت للحصول على أكبر عدد للفروع بالتلقيح بالريزوبيم + الازوتوباكتر فى جميع المواسم.

١٦- أظهر التفاعل الثلاثى أعلى تفوق غير معنوى للبرسوبس شيلينسس على برسوبس جليفلورا فى عدد الفروع على مسافة ٣ متر والتلقيح بالريزوبيم + الازوتوباكتر خلال جميع المواسم.

- الوزن الغض و الجاف / نبات :

١٧- أظهرت النتائج أن البرسوبس شيلينسس كان أعلى فى الوزن الغض و الجاف / نبات من البرسوبس جليفلورا فى جميع المواسم.

١٨- أدت زيادة مسافة الزراعة من ٢ – ٣ متر بين النباتات الى الوصول لأعلى وزن غض وجاف / نبات فى جميع المواسم.

١٩- دلت النتائج على أن التسميد الحيوى أدى الى زيادة معنوية للوزن الغض و الجاف بداية من الكنترول حتى وصل اقصاه مع الريزوبيم + الازوتوباكتر.

٢٠- أظهر التفاعل الثلاثى بين الاصناف و مسافات الزراعة و التسميد الحيوى عدم وجود أى معنوية للوزن الغض و الجاف فى جميع المواسم.

- محصول العلف الغض و الجاف كجم/ فدان :

٢١- دلت النتائج على أن البرسوبس شيلينسس زاد معنويا عن البرسوبس جليفلورا فى محصول العلف الغض و الجاف فى جميع المواسم.

٢٢- أوضحت النتائج على تفوق معنوي لمحصول العلف الغض و الجاف فى جميع المواسم بالزراعة على المسافات الضيقة ٢ متر عن ٣ و ٤ متر.

٢٣- زاد معنويا محصول العلف الغض و الجاف فى جميع مواسم الدراسة بمعاملات التسميد الحيوى وكان اعلاها مع الريزوبيم + الازوتوباكتر.

٢٤- دلت النتائج على تفوق غير معنوى للبرسوبس شيلينسس على البرسوبس جليفلورا للمحصول الغض و الجاف فى جميع المواسم للتفاعل بين الاصناف و مسافات الزراعة و التسميد الحيوى. على مسافة ٢ متر والتلقيح بالريزوبيم + الازوتوباكتر.

- التقديرات الكيماوية (%على أساس المادة الجافة):

- البروتين الخام (C.P):

٢٥- أظهرت النتائج أن اوراق و فروع نبات البرسوبس شيلينسس أعطت أكبر نسبة من البروتين الخام عنها فى البرسوبس جليفلورا فى جميع المواسم.

٢٦- الزراعة على مسافة ٣ متر أعطت أكبر نسبة من البروتين الخام فى جميع مواسم الدراسة ما عدا خلال موسم الربيع ٢٠٠٥ كانت مع ٤ متر.

٢٧- زادت نسبة البروتين الخام فى الاوراق و الفروع بزيادة متوالية بالتسميد الحيوى وكان اعلاها مع الريزوبيم + الازوتوباكتر و اقلها مع الكنترول.

٢٨- أوراق و فروع نبات البرسوبس شيلينسس أعطت أكبر نسبة من البروتين الخام بالزراعة على مسافة ٣ متر و بالتلقيح بالريزوبيم + الازوتوباكتر

- الألياف الخام (C.F):

٢٩- أوضحت النتائج أن اوراق و فروع نبات البرسوبس جليفلورا أعطت اكبر نسبة من الالياف الخام عنها فى البرسوبس شيلينسس فى جميع المواسم.

٣٠- أدت زيادة المسافة من ٢ – ٣ متر بين النباتات الى نقص نسبة الالياف الخام فى جميع المواسم ما عدا موسم الربيع ٢٠٠٥ أدت الى زيادتها.

٣١- تناقصت نسبة الالياف الخام فى الاوراق و الفروع بالتسميد الحيوى وكان اعلاها مع الكنترول و اقلها مع الريزوبيم + الازوتوباكتر فى جميع المواسم.

٣٢- أوراق و فروع نبات البرسوبس جليفلور أعطت أكبر نسبة من الالياف الخام مع الكنترول بالزراعة على مسافة ٤ و ٢ متر خلال موسمى الربيع و الخريف ٢٠٠٥ – ٢٠٠٦ على التوالى.

- محتوى الاوراق و الفروع من الكربوهيدرات الكلية:

٣٣- دلت النتائج على أن البرسوبس شيلينسس زاد معنويا عن البرسوبس جليفلورا فى محتوى الاوراق و الفروع من الكربوهيدرات الكلية فى جميع المواسم.

٣٤- أدت زيادة المسافة من ٢ – ٤ متر بين النباتات الى زيادة معنوية فى محتوى الاوراق و الفروع من الكربوهيدرات الكلية فى جميع المواسم.

٣٥- كذلك حدثت زيادة معنوية فى محتوى الاوراق و الفروع من الكربوهيدرات الكلية بالتسميد الحيوى بلغت اقصاها مع الريزوبيم + الازوتوباكتر.

٣٦- أدت معاملة البرسوبس شيلينسس مع مسافة ٤ متر و التلقيح بالريزوبيم + الازوتوباكتر الحصول على أكبر محتوى للأوراق و الفروع من الكربوهيدرات الكلية.

- الرماد (Ash):

٣٧- أوضحت النتائج أن اوراق و فروع نبات البرسوبس جليفلورا أعطت أكبر نسبة من الرماد عنها فى البرسوبس شيلينسس فى جميع المواسم ما عدا للفروع خلال موسم الربيع ٢٠٠٥.

٣٨- أدت مسافات الزراعة إلى وجود تأثير غير واضح الاتجاه على محتوى الرماد للأوراق والفروع لنباتات البرسوبس وذلك لتقارب محتواها من الرماد وتفاوته خلال مراحل النمو المختلفة .

٣٩- زادت معنويا نسبة الرماد فى الاوراق و الفروع مع التسميد الحيوى حتى وصل أقصاه بالتلقيح بالريزوبيم + الازوتوباكتر خلال جميع مواسم الدراسة.

٤٠- أدت معاملة فروع نبات البرسوبس جليفلورا بالزراعة على مسافة ٢ متر و التلقيح بالريزوبيم + الازوتوباكتر الى زيادة معنوية فى نسبة الرماد للفروع لجميع مواسم الدراسة ما عدا موسم الربيع ٢٠٠٥. فى حين زادت نسبة الرماد معنويا فى اوراقة بالتلقيح بالريزوبيم + الازوتوباكتر و بالزراعة على مسافة ٤ و ٢متر خلال موسم الخريف ٢٠٠٥ و ٢٠٠٦ على التوالى.

- المركبات الكلية المهضومة (TDN):

٤١- دلت النتائج أن اوراق و فروع نبات البرسوبس شيلينسس أعطى أكبر نسبة من TDN عن البرسوبس جليفلورا.

٤٢- أدت زيادة مسافة الزراعة من ٢ – ٣ متر بين النباتات الى زيادة نسبة TDN فى اوراق و فروع النباتات فى جميع مواسم الدراسة ما عدا موسم الربيع ٢٠٠٥.

٤٣- أوضحت النتائج أن التسميد الحيوى أدى الى زيادة نسبة TDN فى اوراق و فروع النباتات فى جميع مواسم.

٤٤- التفاعل الثلاثى أدى الى الحصول على أكبر نسبة من TDN فى اوراق و فروع نبات البرسوبس شيلينسس بالزراعة على مسافة ٣ متر و التلقيح بالريزوبيم + الازوتوباكتر فى جميع مواسم الدراسة ما عدا موسم الربيع ٢٠٠٥.

- البروتين الخام المهضوم (DP):

٤٥- أظهرت النتائج أن اوراق و فروع نبات البرسوبس شيلينسس تفوقت معنويا فى نسبة DP عنها فى البرسوبس جليفلورا فى جميع المواسم.

٤٦- أوضحت النتائج أن الزراعة على مسافة ٣ متر بين النباتات أدت الى زيادة نسبة DP فى جميع المواسم ما عدا فى موسم الربيع ٢٠٠٥.

٤٧- أعلنت النتائج إلى حدوث زيادة معنوية فى نسبة DP للاوراق و الفروع بالتسميد الحيوى خلال جميع مواسم الدراسة بلغت اقصاها مع الريزوبيم + الازوتوباكتر.

٤٨- التفاعل الثلاثى أظهر التفوق المعنوى فى نسبة DP لاوراق و فروع نباتات البرسوبس شيلينسس بالزراعة على مسافة ٣ متر و التلقيح بالريزوبيم + الازوتوباكتر خلال موسمى الربيع و الخريف ٢٠٠٦ للاوراق و خلال موسم الخريف ٢٠٠٥ و ٢٠٠٦ للفروع.

تأثير بعض المعاملات الزراعية على إنتاجية بعض أنواع البرسوبس تحت ظروف رأس سدر

رسالة مقدمة من

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جامعة الزقازيق (فرع بنها) ٢٠٠٢

للحصول على درجة

ماجستير فى العلوم الزراعية

(المحاصيل)

وقد تمت مناقشة الرسالة و الموافقة عليها

اللجنـــــة

أ.د/ حسينى جميل محمد جويفل ....
أستاذ المحاصيل بكلية الزراعة - جامعة الزقازيق

أ.د/ صلاح عباس حسن علام ....
أستاذ المحاصيل بكلية الزراعة بمشتهر - جامعة بنها

أ.د/ سيف الدين عطا الله سيف ....
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د / ناصر خميس بركات الجيزاوى ....
أستاذ المحاصيل المساعد بكلية الزراعة بمشتهر - جامعة بنها

د / السيد على محمد خليفة ....
أستاذ باحث مساعد فسيولوجيا البيئة- مركز بحوث الصحراء – المطرية

تاريخ الموافقة : / / ٢٠٠٨

تأثير بعض المعاملات الزراعية على إنتاجية بعض أنواع البرسوبس تحت ظروف رأس سدر

رسالة مقدمة من

ماهر عبد الحافظ السيد أبو بدوي
بكالوريوس علوم تعاونية زراعية – المعهد العالى للتعاون الزراعى ١٩٩١
دراسات تكميلية لشعبة المحاصيل – كلية الزراعة بمشتهر
جامعة الزقازيق (فرع بنها) ٢٠٠٢

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ماجستير فى العلوم الزراعية
(المحاصيل)

لجنة الأشراف العلمى :

أ.د/ سيف الدين عطا الله سيف ....
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قسم المحاصيل و الميكنة الزراعية
كلية الزراعة بمشتهر

جامعة بنها

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ماجستير فى العلوم الزراعية

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قسم المحاصيل و الميكنة الزراعية

كلية الزراعة بمشتهر

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٢٠٠٨