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Study of Some Herbicides and Plant Density on the Growth and Soya Bean Yield.

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ABSTRACT

Two filed experiments were conducted at the agricultural Experimental Farm during two seasons, to study some weed control treatments and plant density (distance between plants) on weeds competition in soybean fields. Each experiment included16 treatments which were the combination of 8 weed control treatments (6 herbicides beside hoeing and un weeded treatment) and two distances between plants namely, 5 and 10 cm (70000 & 140000 plants/fed.). The obtained results showed that weed control treatments significantly influenced plant height, weight of plants, weight of pods per plant, seeds per plant, weight of 1000 seeds and yield per faddan, But, oil and protein percentage were not affected by weed control treatments .weed control treatments significantly influenced plant height, weight of plants , weight of pods per plant, seeds per plant, weight of 1000 seeds and yield per faddan, But, oil and protein percentage were not affected by weed control treatments. The highest plant height (118.9 cm) and seed yield in kg per faddan (1738.6 kg) were obtained from plants planted at 5 cm distance. Meanwhile , the highest plant weight pods per plant seeds per plant and 1000 seeds were obtained from plants grown at 10 cm distance each. The distance between soybean plants did not affect both oil and protein percentages in seeds. The effect of this interaction on plant height, weight of plant, seed per plant, seeds per plant, 1000 seeds, seed yield per faddan were significant.

Keywords: herbicides, agriculture density, soybean yield.

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INTRODUCTION

To avoid competition during early stages of crop growth it is necessary to keep fields free from weeds. The preceding studies indicated that herbicides and plant density are among the factors that have an important role in keeping soybean fields free from weeds and obtained maximum yields. The loss in yield depends upon the weed competition. Manish and Kewat et al. (2002) have reported that application of pendimethalin (1350.5 g a.i/ha) was markedly superior over control. Raskar and Bhoi (2002) reported that soybean grain yield due to two hand weeding at 15 and 30 DAS was similar to that of pursuit plus at 800 and 960 g/ha and alachlor at 2000 g/ha .On an average, 122% increase in the grain yield of soybean was recorded by application of pursuit plus at 800 g/ha as compared to weedy plot. Chauhan et al. (2002) reported that two hand weedings at 20 DAS and 35 DAS in soybean crop drastically reduced intensity, weed biomass and increased the yield of crop. Govindra et al. (2002) reported that there was more than 87 % reduction in the grain yield of soybean in weedy check when compared with weed free treatment (Govindra et al., 2003). Rohitashav et al. (2004) observed that trifluralin at 1.25 and 150 kg/ha as pre emergence and 1.0 kg/ha as pre-plant soil incorporation produced soybean grain yield similar to weed free treatment. Crop geometrics failed to record significant influence on grain yield applied alone or in combination with blazer caused drastic reduction in the density of Celosia.

Many investigators found that prometryne Singh et al., (1973) and Doersch,"(1980). Linuron ; Baronova et al . (1975) and Abdel Raouf and Fayed , (1978), hoing treatment Fayed et al ., (1983). Trifluralin and metribuzin at 1.0 + 0.5 kg/ha Cruz et al .,(1980), stomp Moursi et al .,(1980), linuron-butralin mixture Salim, (1982) and prometryne, prometryne + amex, prometryne + ronstar and hoeing treatments Moshtohory (1982) gave a favourite effect on weeds . Chauhan et al. (2002) revealed that the application of alachlor at 1.5 kg and, pendimethalin 1.5 kg /ha as pre-emergence and two hand weeding at 20 and 35 DAS in soybean crop drastically reduced weed density, weed biomass and increased the yield of crop. Rohitshav et al. (2003) reported that pre-emergence application of pendimethalin 1.5 kg /ha produced soybean grain yields similar to weed free treatment. Rajput and Kushwah (2004) observed that pre-emergence application of pendimethalin at 1.0 kg/ha followed by one hand weeding at 30 days after sowing was the most profitable for controlling the weeds in soybean. Pandya et al. (2004) found that two hand weedings and clomazone with hand weeding produced higher grain yield. Crop geometrics failed to record significant influence on grain yield. Rajput and Kushwah (2004) observed that two hand weeding alone 20 and 30 DAS after sowing gave highest weed control efficiency 85.6% with seed yield 1860 kg/ha.

Not only herbicides but also the plant density are among the factors that have an important role in keeping soybean fields free of weeds. Gurnah (1978) showed a very high plant population gave better weed control than lower populations. The present investigation was carried out to influence of herbicides and agriculture density on weeds associated with crop soybean (Glycine max L) Few demonstrations exist of the effect of seeding rates on weed control and soybean yield in the absence of herbicide use. In untreated checks in a Michigan study, mean weed biomass was lowest in soybean planted with 76-cm row spacing at seeding rates of 432,000 seeds/ha compared to 308,000 and 185,000 seeds/ha, and the largest soybean yield resulted from the highest seeding rate in both locations in 2002 (Rich and Renner 2007). Harder et al. (2007) reported higher soybean yield for the weedy check plots with 76-cm row spacing with 445,000 plants/ha compared to lesser seeding densities with the same row spacing. However, weed biomass was not affected by a soybean seeding rate increase from 296,000 plants/ha to 445,000 plants/ha regardless of row spacing. Such results demonstrate that increased seeding rates may not be an effective stand-alone weed control tactic, but very few investigations have tested the effect of seeding rate on weed control in organic soybean systems utilizing other tactics such as mechanical weed control. Higher seeding rates may result in a more competitive soybean population and better economic returns for organic soybean producers. Experiments were conducted in 2006 and 2007 to investigate seeding rates of 185,000, 309,000, 432,000, and 556,000 live seeds/ha. All rates were planted on 76-cm row spacing in organic and conventional weed management systems. Increased soybean seeding rates reduced weed ratings at three of the five sites. Increased soybean seeding rates also resulted in higher yield. The present investigation was carried out to study effect of some herbicides and agriculture density on the growth and soyabean yield.

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MATERIAL AND METHODS

Two filed experiments were conducted at the agricultural Experimental Farm during two seasons, to study the effect of some weed control treatments and plant density (distance between plants) on growth and yield of soybean. The soil of the experiments was clay loam with medium fertility, containing 1.89% organic matter and p^H7.8.

A Factorial experiment in randomized complete block design with four replicates was used. The plot size was 20 m^2 (4 m x5 m) with 5 rows (5 m in length and 70 cm apart); each experiment included 16 treatments which were the combinations between 8 weed control treatments and 2 plant densities.

Weed control treatments were as follow:

1. Dintramine (cobex or USB 3584): N^3, N^3- Diethyl 2, 4 –Dinitro -6- trifluoromethyl-1,3-phenylenediamine (2.5 % E.C) at a rate of 1.0 L/fad.
2. Pendimethalin (stomp, Ac. 92553) N (1-Ethylpropyl)-2, 6 dinitro-3, 4-xylidine (33%E.C) at a rate of 2.5 L/fad.
3. Trifluralin (Treflan): Trifluoro 2, 6 – dinitro-N-N dipropyl-p-toluidine (48% E.C) at a rate of 1.0 L/fad.
4. Prometryne (Gesagard 50 % a.i. w.p.) 2 methoxy 4,6 bis isopropyl amino 2 methyl thio 1,3,5 triazine at a rate of 1.0 Kg/fad.
5. Linuron (Afalon 50% a.i, w.p.) N 1, 3, 4- dichloro- phenyl N-methoxy-N-methyl urea at a rate of 1.0 Kg/fad.
6. Diphenamid (Enide 50% W.P.) N-N-dimethyl-2, 2-diphenyl acetamide at a rate of 2.0 Kg/fad.
7. Hand hoeing (Twice) after 15 and 25 days from sowing.
8. Control (un weeded).

Distance between plants were as follows:

1. 5 cm between plants (140000 plants / fad).
2. 10 cm between plants (70000 plants /fad).

All herbicides were sprayed on soil surface and incorporated immediately into the soil and irrigation was carried out on the same day. The used rates were as product form. Sprayers sack with water volume of 200 liters per faddan was used.

Soybean seeds var. Clark were sown on 24th and 18th of April in the 1st and 2nd seasons, respectively. When the soil moisture was adequate for germination, after thinned in order to give the proper distance between plants and density. Nitrogen fertilizer was applied at 100 kg /fad. in the form of urea (46%N).

The major weed species associated with the soybean crop in 1st seasons were mostly broad–leaved weeds and they were as follow*, Portulaca ole*raceae L. (*Purslane), Chenopodium murale* L. (Goose foot), *Amaranthus caudatus* L. (Pig weed). In 2nd season, the prevailing weeds were; *Beta vulgaris* L. (leaf beet), *Chenopodium murale* L. (Goose foot), *Medicago hispida* L. and *Echinocloa_ colonum* (Jungle rice) as the only grass weed. In both seasons *Cyperussp.* L. (nut sedge) was the only perennial weed appeared in the field plots.

Assessments

On soybean

The following data were obtained at harvest on samples each of 25 plants. These plants were taken at random from each plot.

1. Plant height in (cm).
2. Top weight of plant in (gm).
3. Weight of pods per plant (gm).
4. Weight of seeds per plant (gm).

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5. Weight of 1000 seeds (gm).
6. Seed yield in kg/plot and calculated to kg per faddan.

Seed chemical composition

Oil Percentage

The oil percentage in seeds was determined using the method of the Association of Official Agricultural Chemists (1955). For oil determination, seed samples were dried at 105°C for 30 minutes. Dried seeds were grinded for 128 samples of two seasons. Five grams of each sample was extracted using soxhlet apparatus. Petroleum ether (of B.P. 40 - 60°C) was used in the extraction.

Protein percentage

Protein percentage was determined by kjeldahl apparatus as nitrogen percentage according to the method of the Association of Official Agricultural Chemists (1955) by using 0.05 gram for each sample (128 samples of two seasons) and modified by distilling the ammonia into boric acid and titration with standard HCl (N/70). Then protein percentages were calculated by multiplying nitrogen percentages by the factor 6.25.

Statistical Analysis

All data obtained in both seasons were subjected to the proper statistical analysis for both seasons as well as the combined analysis was also carried out according to Snedecor and Cochran (1967). Treatment means were compared using Duncan's multiple range test (Duncan, 1955) at the 5% level of probability.

RESULTS AND DISCUSSION

In the present study two field experiments were carried out to study the effect of some weed control treatments and plant density (distance between plants) on growth and yield of soybean.

Effect weed control treatment on growth yield and yield components:

At harvesting time the following characters were estimated, plant height, plant weight, weight of pods /plant, weight of seeds/plant, 1000-seed weight and seed yield/faddan as shown in Figers (1-4).

Plants height

Plant height was significantly affected by weed control treatments Fig.(1). The highest increase in plant height was obtained by the two–hoing treatment followed by that of dinitramine and linuron treatments.

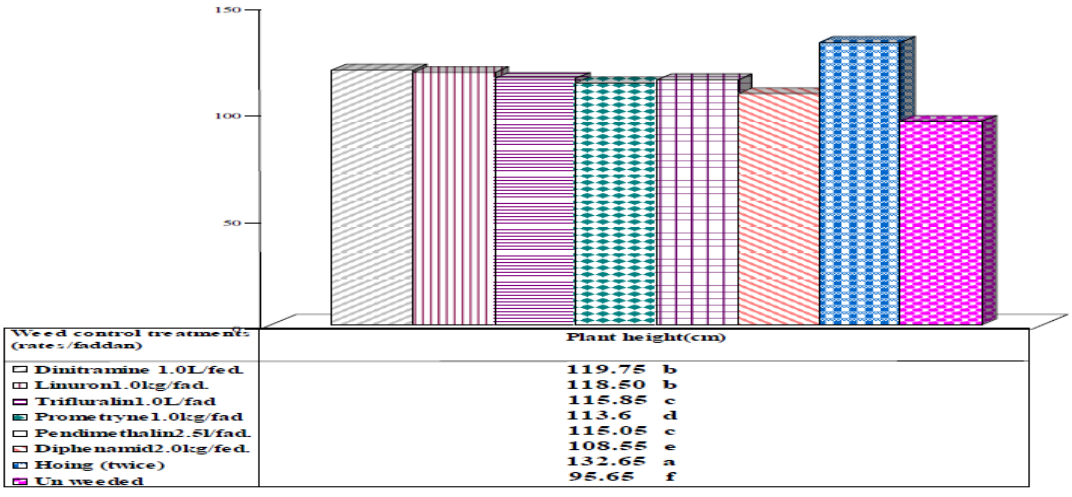

Figure 1: Effect of weed control treatments on Plant height

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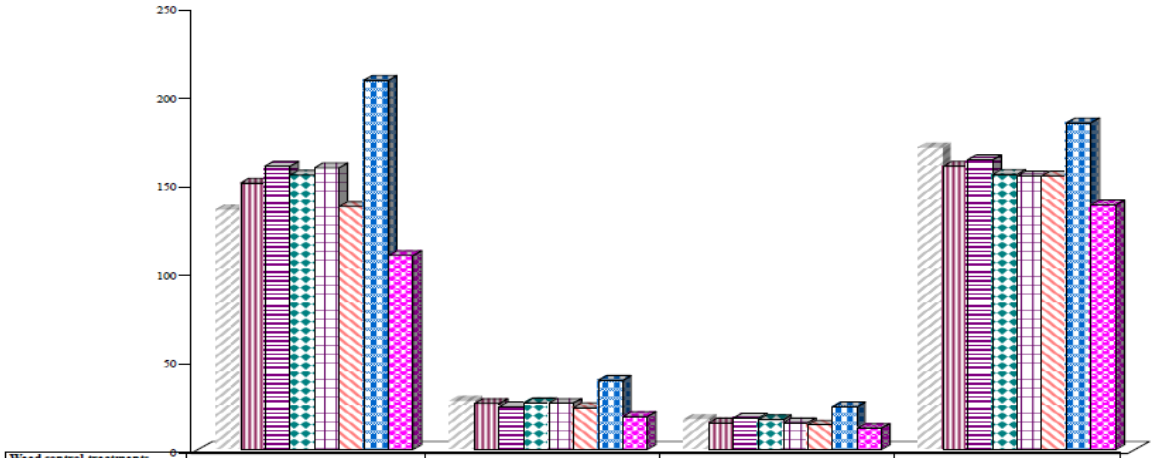
On the contrary, the lowest increase in plant height over the control (un-weeded) treatment was recoded with diphenamid followed by that of prometryne treatment. The increases in plant height amounted 27.89, 20.12, 19.28, 17.43, 16.86, 15.80 and 11.88 % of the unweeded treatment due to hoing, dini-tramine, linuron, trifluralin, pendimthalin, prometryne and diphenamid treatments, respectively.

These results are in general agreement with those obtained by Moomow and Robinson (1972), Saghir and Bahatti (1972), and Salim (1982).

Plant Weight

Results in Fig. (2) revealed that all weed control treatments increased to different extents the plant weight if compared with the un weeded treatment. Hoing showed superiority over the studied herbicidal treatments in that respect. The available results showed no significant differences in plant weight due to herbicidal treatments with the exception of dinitramine treatment. This latter treatment was significantly inferior in that respect if compared with trifluralin and pendimethalin treatments.



Weed control treatments (rates/faddan)	Weight plant (g)	Weight Pods per plant (g)	Weight seed Per plant (g)	Weight 1000 Seeds (g)
Dinitramine 1.0L/fed.	135.5 c	27.46 b	16.91 bc	170.46 ab
Linuron1.0kg/fad.	150.5 bc	25.82 bc	14.92 bc	159.80 b
Trifluralin1.0L/fad	160.0 b	24.02 c	17.91 b	163.7 b
Prometryne1.0kg/fad	154.8 bc	26.46 bc	16.98 bc	155.6 b
Pendimethalin2.5l/fad.	159.0 b	26.22 bc	15.24 bc	154.4 bc
Diphenamid2.0kg/fed.	137.1 bc	23.88 c	13.97 bc	154.6 bc
Hoeing (twice)	208.7 a	39.02 a	24.14 a	184.6 a
Un weeded	109.7 d	18.80 d	12.14 c	138.3 c

Figure 2: Effect of weed control treatments on weight plant, weight pods /plant, weed seed /plant and weight 1000 seeds.

Weight of pods/plant

The response of this character to weed control treatments was similar to that of plant height. Hoeing (twice) exceeded all treatments in weight of pods per plant, followed by dinitramine. This latter treatment (dinitramine) dose not differ significantly from linuron, prometryne and pendimethalin treatments, but was significantly superior in this respect to trifluralin and diphenamid treatments. The increase in weight of pods per plant due of herbicides may be attributed to the increase of number of pods, to hoing and application number of branches, leaves and dry matter accumulation per plant.

Weight of seeds/plant

Results in the Fig. (2) showed the superiority of two- hoeing treatment over other treatments in this character. Differences between herbicidal treatments were not great enough to reach the 5% level of significance number of seeds per plant is observed in control. All treatments showed significant results over control. Maximum number of seeds per plant (98.8) was observed in pendimethalin 1350.5 (g a.i/ha) at harvest.

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Weight of 1000 seeds

The effect weed control treatments on weight of 1000 seeds was similar to that of weight pods per plant. Hoeing treatment (twice) exceeded all herbicidal treatment. In this respect, followed by dinitramine treatments. Difference between the previous two treatments did not reach the significant level. Moreover; differences between all herbicidal treatments under investigation were not great enough to reach the significant level. The superiority of the two hoeing as well as dinitramine treatments could be attributed to the increase in weight of pods per plant and the dry matter accumulation (plant height) per plant Fig.(1).

Seed yield (kg/faddan)

Data presented in Fig. (3) showed significant increases in seed yield per faddan due to weed control treatments. The highest seed yield/faddan was produced by the 2-hoeing treatment, followed by that of dinitramine. The increase in seed yield /faddan amounted 64.24 and 53.13% of the unweeded check due to hoeing and dinitramine treatments, respectively. This increase in seed yield accompanied these two treatments may be attributed to their remarkable effect on plant growth (plant height), weight of pods. Plant and the 1000-seed weight. These results are in full agreement with those reported by. Baranova et al. (1975) Wang, et al. (1975) Malyshev (1976); Fayed, et al. (1983); Moursi et al. (1980). Hagood et al. (1980), Zanin et al. (1980) Cruz et al. (1981) .Deuper, (1981).and Guillermo et al. (2009).

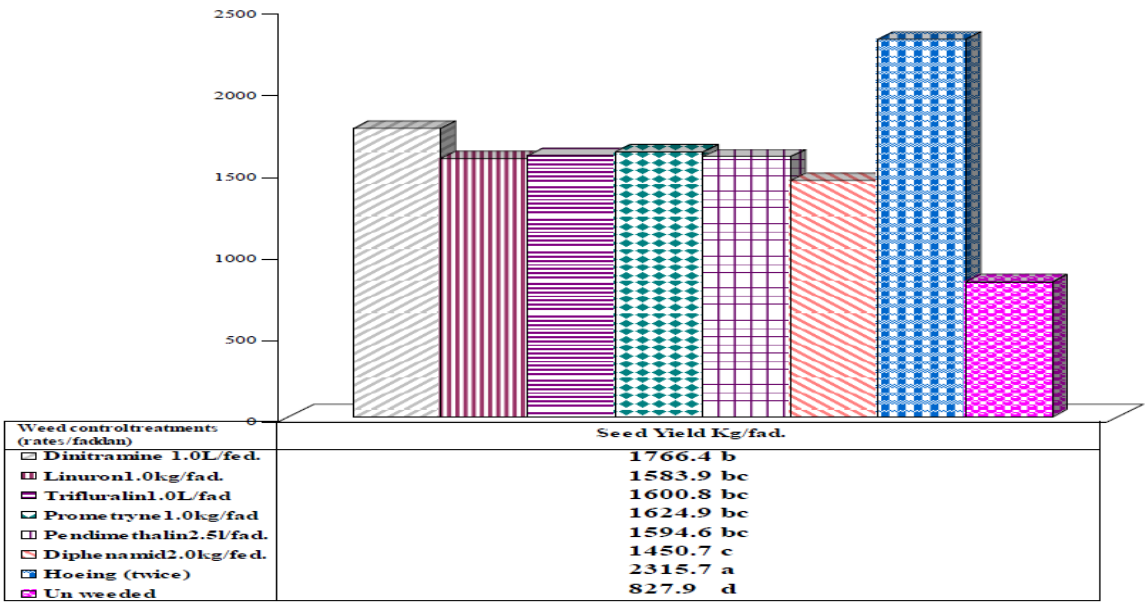

Figure 3: Effect of weed control treatments on seed yield

Fayed et al. (1983) showed that hoeing, trifluralin, linuron, ancrack, and butralin treatments gave the highest increases in seed yield (466, 455, 428, 436 and 415 % respectively) over the un weeed treatment. Chauhan *et al.* (2002) reported that two hand hoeing at 20 DAS and 35 DAS in soybean crop drastically reduced intensity, weed biomass and increased the yield of crop. Govindra *et al.* (2002) reported that there was more than 87 % reduction in the grain yield of soybean in weedy check when compared with weed free treatment. All the three herbicide Rajput and Kushwah (2004) observed that two hand weeding alone 20 and 30 DAS after sowing gave highest weed control efficiency 85.6% with seed yield 1860 kg/ha. Rajput and Kushwah (2004) observed that two hand weeding alone 20 and 30 DAS after sowing gave highest weed control efficiency 85.6% with seed yield 1860 kg/ha.

Oil and protein percentages

Data presented in Fig. (4) showed no significant effect of studied weed control treatments (chemical and hoeing).On both crude oil and crude protein percentages.

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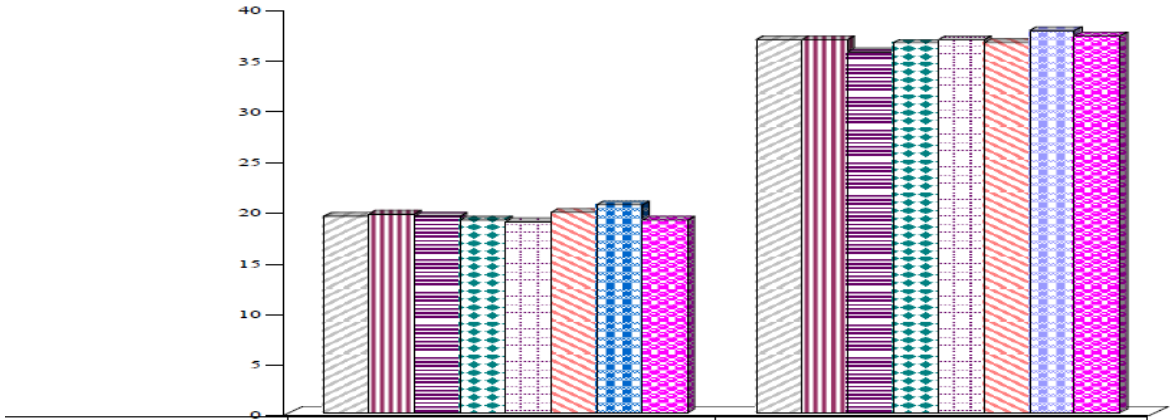

Weed control treatments (rates/faddan)	Oil%	Protein %
Dinitramine 1.0L/fed.	19.46 a	36.86 a
Linuron1.0kg/fad.	19.69 a	36.86 a
Trifluralin1.0L/fad	19.45 a	35.70 a
Prometryne1.0kg/fad	19.05 a	36.55 a
Pendimethalin2.5l/fad.	18.93 a	36.88 a
Diphenamid2.0kg/fed.	19.82 a	36.56 a
Hoeing (twice)	20.57 a	37.79 a
Un weeded	19.03 a	37.29 a

Figure 4: Effect of weed control treatments on oil % & protein%

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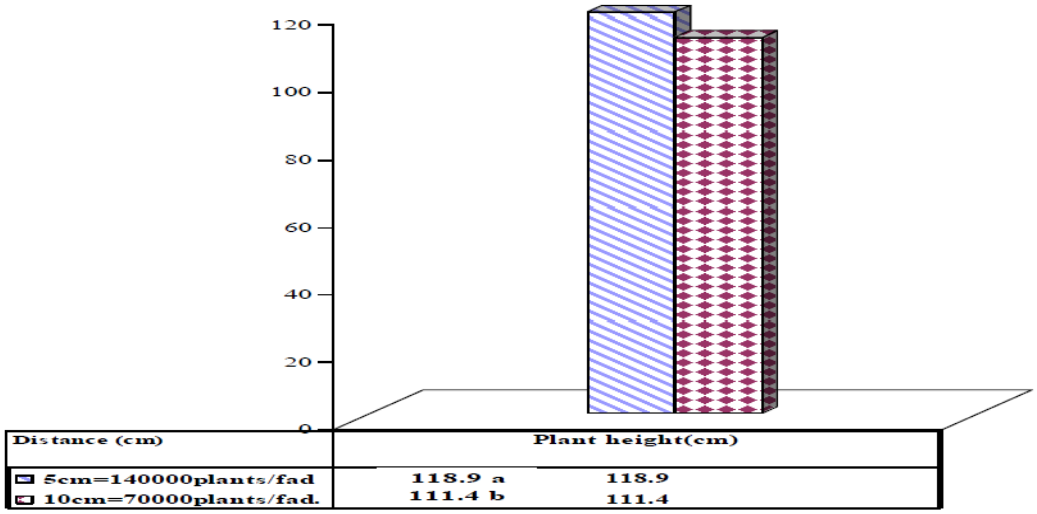
These results agreed with those obtained by Voevodin (1969) and Bahan, et al (1972) Saghir and Bhatti (1972). Venturella, et al. (1976), Malyshev(1976)Deuper, et al . (1980) and Moshtohry (1982).

Effect of plant distance on growth, yield and yield components

Plant height

Results in Fig. (5) showed clearly that plant density had significant effect on plant height. Decreasing the distance between plants (narrower plant densities) increased significantly the plant height. This may be attributed to the high intra-specific competition for light at denser plant populations.



Distance (cm)	Plant height(cm)	
5cm=140000plants/fad	118.9 a	118.9
10cm=70000plants/fad.	111.4 b	111.4

Figure 5: Effect of plant distance on plant height

Plant weight

Distance between soybean plants had significant effect on plant weight at harvesting time. Plant weight at the lowest plant density (wider distance) was significantly higher than that obtained with narrower plant distances. This may be attributed to the decrease in intraspecific competition. These results are in

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harmony with those obtained by Hassan (1984) who reported that increasing the seeding rate decreased significantly the dry weight per lentils plant.

Weight of pods /plant

The distance between plants had significant effect on the fresh weight of pods per plant Fig.(6). It tended to increase (from 23.2 to 29.2 gm) with increasing the distance between plants. This may be due to the increase of nutrients at the lowest plant density.

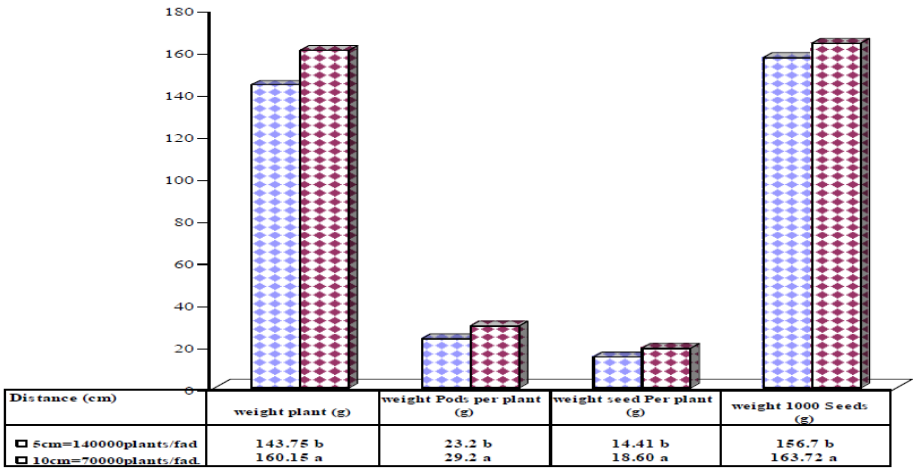

Figure 6: Effect of plant distance on weight plant, weight pods /plant, weed seed /plant and weight 1000 seeds.

Weight of seeds/plants

Concerning the effect of distance between soybean plants on fresh weight of seeds per plants, results showed similar trend. Increasing distance between plants from 5 to 10 cm increased weight of seeds per plant by about 22.25 %. These results are in agreement with those obtained by Wilcox (1974), and Moshtohry (1982).

Weight of 1000 seeds

Results in Fig. (6) indicated that increasing distance between soybean plants increased the weight of 1000 seeds from 156.7 to 163.7 gm. this may be due to the increase of weight of plants and dry matter accumulation by plants at the low plant density.

Seed yield (kg /faddan)

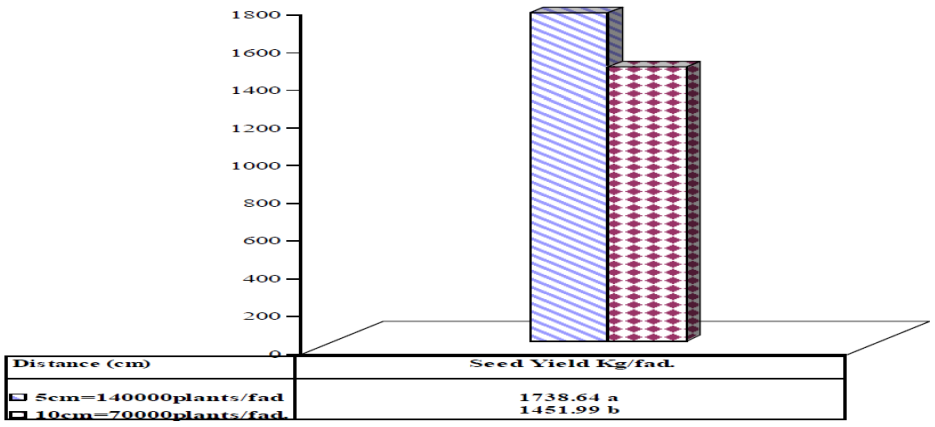

Figure 7: Effect of plant distance on seed yield

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Plant density showed significant effect on seed yield per fadden Fig. (7). Seed yield was significantly increased with increasing plant density.

The increase in seed yield per faddan amounted 16.48% due the increase of plant population from 70000 to 140000 plants/faddan. This significant increase in seed yield due to the increase in plant density indicates that the increase in number of plant per unit area could compensate the reduction in dry matter accumulation weight of pods and seeds per plant as well as 1000 – seed weight. The results of the present investigation are in full agreement with those obtained by Basnet, et al. (1974), Gurnah (1978) and Moshtohry (1982). Soybean yield was significantly affected by its densities and the yield increased as density increased up to 40 plants/m^2 (**Raei *et al.*, 2008**).

Oil and protein percentages

The effect of distance between soybean plants on oil and protein percentage of soybean seeds was not observed Fig.(8). Similarly, Weber, et al. (1966) showed that plant spacing and population had small effect on oil content. These results are in agreement with those obtained by Saghir and Bhatti (1970), Saghir and Bhatti (1972), Venturella (1976), Malyshev (1976), Deuper et al. (1980), Moursi et al. (1980) and Moshtohry (1982).

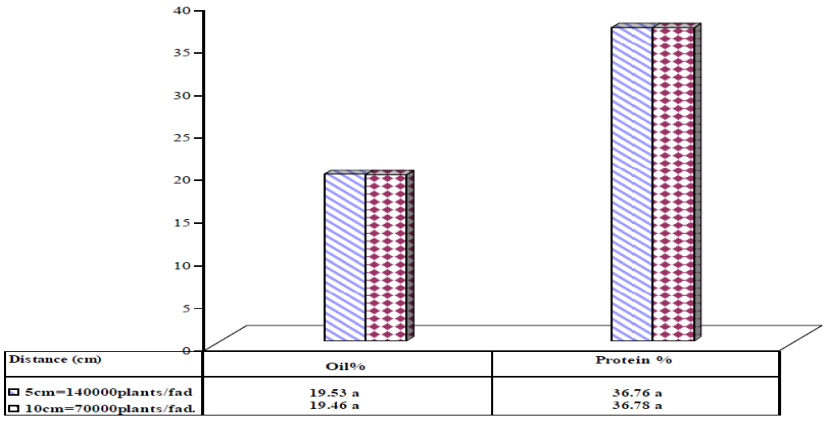

Figure 8: Effect of plant distance on oil% & protein %.

Effect of the interaction between wed control treatments and plant distance on Growth, yield and yield components:

Table 1: Effect of the interaction between plant distance and weed control treatments

Weed Treatments	Distance	Plant Height (cm)	weight (gm)				Seed Yield kg/fad.
			Plant	Pods/ Plant	Seeds /Plant	1000 seeds	
Dinitramine	5	123.58 c	131.10 cd	26.39 bc	16.90 b	166.90 ab	1880.50 bc
Linuron	5	121.45 cd	147.45 c	23.50 c	13.50 b	160.60 bc	1755.00 c
Trifluralin	5	120.12 d	147.70 c	28.00 bc	16.20 b	161.65 ab	1801.00 bc
Prometryne	5	118.38 de	136.75 cd	24.50 bc	14.92 b	150.50 b	1791.00 bc
Pendimethalin	5	117.40 e	136.40 cd	20.80 c	13.06 b	148.60 b	1703.50 cd
Diphenamid	5	112.56 gh	129.30 cd	23.00 c	13.82 b	149.90 b	1528.00 cd
Hoing (twice)	5	134.68 a	196.34 ab	37.70 ab	22.90 a	185.50 a	2537.00 a
Un weeded	5	101.52 k	112.10 d	17.90 c	12.24 b	130.50 c	909.00 e
Dinitramine	10	115.99 f	139.90 cd	28.70 bc	17.05 bc	173.90 ab	1651.00 cd
Linuron	10	116.07 ef	157.85 bc	28.40 bc	16.24 b	159.00 b	1412.00 d
Trifluralin	10	111.69 h	172.20 bc	30.60 bc	19.50 ab	165.60 ab	1399.00 d
Prometryne	10	108.67 i	172.80 bc	28.80 bc	19.02 ab	161.30 b	1458.00 cd
Pendimethalin	10	113.15 g	180.70 b	31.95 b	17.35 b	160.20 b	1485.00 cd
Diphenamid	10	104.29 j	145.90 c	24.80 bc	14.06 b	159.40 b	1372.00 d
Hoeing (twice)	10	131.09 b	221.20 a	40.60 a	25.30 a	184.00 a	2093.00 b
Un weeded	10	90.01 L	107.30 d	19.90 c	12.00 b	146.10 b	746.00 e

Results in Table (1) demonstrated the significant effect of the interaction between plant densities and weed control treatments on growth, yield and yield components of soybean plants. This significant effect revealed that the response to weed control treatments was not similar at the two plant densities under investigation.

Plant height

At the narrow plant distance (5 cm between plants) no significant differences were obtained between linuron, trifluralin and prometryne treatments in respect to this character. This was not the case under the wide plant distance.

Plant weight

Results showed that differences in plant weight due to herbicidal treatments were not great enough to reach the 5% level of significance under the high plant density. On the contrary, significant differences were occurred at the low plant density.

Weight of pods per plant

Results in Table (1) indicated clearly the superiority of hoeing treatment at the low plant population over all herbicidal treatments; this was not true at the dense planting.

Weight of seeds/plant

At narrow planting (high plant density), hoeing showed superiority over all herbicidal treatments in respect to this character, this was not true with the wide planting.

1000- seed weight

Data presented in Table (1) showed the high efficiency of all herbicidal treatments with the narrow planting. All herbicidal treatments increased significantly the 1000 – seed weight at dense planting. This was not achieved with some herbicidal treatments at the wider planting (10 –cm between plants).

Seed yield (kg/fad.)

The available results showed higher seed yield (kg/fad.) at narrow planting. This was almost true with all treatments even with the control treatments, but the rate of increase was not the same for all weed control treatments.

REFERENCES

[1] Abdel-Raof MS and Fayed MT. Influence of some pre-emergence herbicides on weed control and yield of soybean crop. Fac. of Agric., Ain shams Univ. Res. Bull. No. 1978;817:23.

[2] AOAC. Official Methods of Analysis, 8th Ed., Association of Official Agriculture. Chemists, Washington, D.C. 1955.

[3] Baranova MM, Delikov II, Beloshaphin SI and Shatokhin A I. The efficiency of using herbicides in soybean crops in the Far East., Sibirskii vestnik sel'shokhaz. Ven. 1975;5(3): 58 - 62. (c.f. weed Abst. 26 (6) :1542, 1977).

[4] Basnet B, Mader EL and Nickll, CD. Influence of between and within row spacing on agronomic characteristics of irrigated soybeans. Agron. J, 1974;66:657 - 659.

[5] Bahan VM, Singh M and Maurya RA. Studies on the chemical of weeds in soybean. Ind . J. weed Sc., 1972;17: 4 -16.

[6] Chauhan YS, Bhargava MK and Jain VK, Effect of herbicides on weeds and soybean. *Indian J. Weed Sci*, 2002;34 (3&4):213-216.

[7] Cruz LSP, and Oliveira DA. Effect of dinitramine incorporated before planting on soybeans. Planta Daninha 1981;2(2): 96 - 101. (c.f. weed Abst. 30 (1):59, 1981).

[8] Cruz LSP and Leiderman L. Weed control in soybeans with herbicide mixtures. Planta Daninha 1980;1 (1) :13 -17 .(c.f. weed Abst. 29 (7): 1945,1980)
[9] Deuper R, Savy Filho A and Batoglia OC. Effect of herbicide on growth and nutrient content in groundnuts (Arachis hypogaca L.) 1. Soil incorporated herbicides. Agron. Coixa postal 28, 13100 Campinas, S.P. Brazil. (c.f. weed Abst. 1980;29 (6):1571).
[10] Deuper R and Camargo PN. Effect of herbicides and sowing densities on the development and production of soybeans, In Resumos XIII congresso Brasileiro de Herbicides e Ervas. Daninhas, Bahia, 56. (c.f. weed Abst. 1981;30 (8) :2740).
[11] Duncan D B. Multiple range and multiple F. tests. Biometrics, 1955;11: 1-42.
[12] Doersch, H. E. and Teasdale, J. R. (1980), performance of herbicide combinations for weed control in soybean. Weed control conference, 33: 67- 68. Dep. Agron Univ. Wiscosin Madison. (c.f. Weed Abst. 29 (9):2764).
[13] Fayed, M. T., Olfat H. El-Bagoury and H.T. Al-Marsafy (1983),The effectiveness of numerous herbicides in soybean. Egyptian Society of Crop. Science. Proc. of the first conf. of Agron. (2): 289-678.
[14] Guillermo D. Arce, Palle Pedersen, and Robert G. Hartzler (2009), Soybean seeding rate effects on weed management Weed Technology 23:17–22
[15] Govindra Singh, Mahendr Singh and Singh, V.P., (2002), Bio-efficacy of haloxyfop on soybean and associated weeds. *Indian J. Weed Sci* ,34 (3&4) : 217-219.
[16] Govindra Singh, Singh, V. P., Mahendra Singh and Rajesh Singh, K.R.,(2003), Effect of oxyflurofen on weeds and soybean yield. *Indian J. Weed Sci.*, 35 (3&4) : 275-276.
[17] Gurnah, A. M. (1978), The effects of plant population, spacing and weeding on yields of soybeans. Proc. East African weed Sci. Conf. 6:85-89.
[18] Hagood, E.S.: Williams J.L., JR., and Bauman, T.T. (1980), Influence of herbicide injury on the yield potential of soybeans. Weed Sci. 28 (1): 40-45.
[19] Harder, D. B., C. L. Sprague, and K. A. Renner. (2007), Effect of soybean row width and population on weed, crop yield, and economic return. Weed Technol. 21:744–752.
[20] Hassan, W. M., (1984), Effect of some herbicides and agriculture density on productivity of lentils and chick pea. Ph. D. Thesis, Agronomy Dept. Fac. Agric. Ain shams Univ.
[21] Pandya, N., Chouhan, G. S. and Nepalia, V., (2004), Effect of varieties, crop geometries and weed management practices on weed growth and grain yield of soybean. Indian J. Weed Sci., 36 (3&4) : 203-206.
[22] Raei, Y.; K. G. Golezani, A. Javanshir, H. Aliari and A. Mohammadi (2008), Effect of plant density on soybean and sorghum. J. of Sci. and Tench. of Agric. and natural Resources. 12: 45 (A), 33-45.
[23] Rajput, R. L. and Kushwah, S. S., (2004), Integrated weed management in soybean on farmersfield. *Indian J. Weed Sci*., 6(3&4) : 210-212.
[24] Rohishav Singh, Govindaraj Singh, Ravi Gopal Singh and Mahendra Singh., (2004), Effect ofdoses and stages of application of trifluralin on soybean and associates weeds. *Indian J. Weed Sci*., 36 (3&4) : 199-202.
[25] Rich, A. M. and K. A. Renner. (2007), Row spacing and seeding rate effects on Eastern Black Nightshade (Solanum ptycanthum) and soybean. Weed Technol. 21:124–130.
[26] Rohitashav Singh, Govindra Singh and Mahendra Singh., (2003), Bio-efficacy of acetochlor for weed control in soybean. Indian J. Weed Sci.,35 (1&2) : 67-69.
[27] Raskar, B. S. and Bhoi, P. G., (2002), Bio-efficacy and phytotoxicity of pursuit plus herbicides against weeds in soybean. *Indian J. Weed Sci*., 34 (1&2) : 50-52.
[28] Malyshev, N. E. (1976), The influence of herbicides on the seed yield and quality of soybean Poltava. Province Khim Vsel ′skom. Khoz. 4 (1):62-64. (c.f. Weed Abst. 26 (7):1918. 10977).
[29] Manish Bhan and Kewat, M. L., (2002), Economics of herbicidal weed control in soybean *Indian J. Weed Sci*., 34 (1&2) : 139-140.
[30] Moomow, R. S. and Robinson, L. R. (1972), Broadcast or banded chloramben with tillage Variables in soybeans. Weed Sci. 20:502 -506.
[31] Moshtohry, M. R. (1982), Weed control in soybean under some agronomic practices. Ph. D. Thesis, Fac. of Agric (Agronomy) Zagazig Univ.
[32] Moursi, M. A., Rizk, T. Y., Fayed, M. T. and Roshdy, A. (1980), Yield and yield components of soybean as affected by chemical weed control. Annual of Agric. Sci., Moshtohor, 14: 21-31.
[33] Saghir AR and Bhatti MS. Effect of herbicides on yield and quality of soybeans. The Annual Meeting of the weed Sci. 1972;53 -61.

[34] Salim AA. weed control in soybean and its related problems. Ph.D. Thesis, Fac. Agric. Zagazig Univ. 1982.
[35] Singh JN, Kirti Kumar K and Pandito ML. Herbicidal control of weeds in peas. Indian J. of weed Sci. 1973;5 (1): 42 – 47
[36] Snedecor DM and Cochran WB. Statistical analysis methods 6th edition. Iowa State Univ. Press Ames, Iowa, U.S.A. 1967.
[37] Venturella LR, Ruckhein Filho C and Davic GG. chemical weed control in soybeans. Mar del Plata, 1356, Av. Corrientes 123. Buenos Aires, Argentina, ASAM. 2: 267-276. (c.f. Weed Abst., 1976;118 (5): 2040.
[38] Wang CC, Chang SS and Tsay JS. Effect of the application method of herbicides on weed control and yield of soybean. J. Agric. Assoc. China, 90: 11-26. (c.f. Weed Abst. 1975;25 (8): 2232.
[39] Weber CR, Shibles RM and Byth DE. Effect of plant population and row spacing on soybean development and production Agron. J. 1966;58: 99-102
[40] Wilcox JR. Response of three soybean strains to equidistant spacing. Agron. J. 1974;66: 409-412.
[41] Zanin G. Weed control of soybean. Rivista di Agronomia 13 (1): 169 -180. (c.f. Field Abst. 1980;33 (11): 8852).