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GROWTH ATTRIBUTES OF SOYBEAN AS AFFECTED BY TILLAGE SYSTEM, PLANT POPULATION DENSITIES AND WEED CONTROL TREATMENTS.

Taha, E.M. , El-Karamity, A.E. Salem, M.A. and Abd El-Kader, Asmaa, A.M.

Agron. Dep., Fac. Agric., Minia Univ., Egypt.

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ABSTRACT

To examine the effects of tillage system, plant densities, and weed control treatments as well as their interactions on weed characteristics and growth attributes of soybean (*Glycine max*, L., Merrill) cv. Giza111, two field experiments were conducted at the experimental farm of the Faculty of Agriculture, Minia University, during the two successive seasons of 2019 and 2020.

The obtained results proved that full-tillage enhanced all tested aspects of soybean growth (plant height, number of branches per plant, leaf area, and leaf area index) as well as reduced weeds characteristics relative to no-till in both seasons. Sowing plants at a rate of 140000 plants/fed. produced the highest values of branches number per plant, leaf area, and leaf area index, while the tallest plants and the lowest weeds dry weights were achieved at 210000 plants/fed in both seasons. In most cases, hand hoeing twice (35 and 50 DAS) produced the tallest plants with highest number of branches, while plants received Select super 500 ml/fed. (35 DAS) plus Basagran 750 ml/fed. (50 DAS) recorded the largest LA and LAI. It could be concluded that for the best soybean growth was to adapt full-tillage system, sowing plants at 140000 plant/fed. and treated the plants with hand hoeing twice.

Key words: soybean, growth, tillage, population density, weed control.

INTRODUCTION

The soybean [*Glycine max* (L.) Merr.] is an important global legume native to East Asia that is commonly farmed for its edible bean, which has a wide range of applications. Because soybean is an important source of food, protein, and oil (42-45% protein and 20-25% oil), soybean is an essential food crop for human consumption.), more investigations are needed to boost its output under various situations. The top five soybean producing countries in the world are the United States, Brazil, Argentina, China, and India **(Medic *et al*., 2014; Soliman *et al*. 2015** and **Pagano and Miransari, 2016)**.

Crops production with no-till requires fewer labor and fuel consumption **(Gozubuyuk *et al*., 2020)**, reduces greenhouse gas emissions **(Mangalassery *et al*., 2014)**, and improves soil health relative to agricultural production based on tillage **(Nunes *et al*., 2018)**. However, weed control without tillage can be difficult, especially in organic systems. Ecological weed management can aid in crop production success **(Bastiaans *et al*., 2008)**. Soil tillage is crucial because it controls both crop productivity in terms of yield and environmental implications. Soil tillage has been used for millennia to reduce weed density while improving water and nutrient availability. Simultaneously, brief exposure to sunlight caused by soil inversion during tillage might cause the germination of deeply buried weed seeds **(Lal, 2009)**.

Increased crop density and the use of a high biomass cover crop mulch in no-till crop cultivation are two cultural weed management methods that may filter weed communities through changes in resource availability **(Lowry and Smith, 2018)**. Because an overabundance of soybeans alters plant structure, mostly by lowering the amount of pods per plant. Thus, it is important to quantify not only field-specific but also within-field variability of plant density **(Habibi *et al*., 2021)**. Soybean plant density is a key aspect in agricultural output performance. Because of the high number of plants per unit area, early plant overlapping, and eventual plant loss, estimating soybean plant density in the later phases of growth should allow the ultimate plant number to be determined and reflect the state of the harvest. Plant height, branch number, and fruitful nodes are all key yield components **(Argenta *et al*., 2001; Ranđelović *et al*., 2020)**.

Weed competition in soybean cultivation starts with crop germination and remains until maturity unless appropriate weed management strategies are implemented. Early weed competition can be detrimental to soybean **(Eyherabide and Cendoya, 2002)**. Effective weed management techniques in soybean are necessary due to weed infestations and the resulting productivity losses. In integrated weed management systems, mechanical weeding is just as important as chemical weed control **(Kunz *et al*., 2015)**.

The aim of this research is to gain a better understanding of how the tillage system, plant population density, and

weed control technique affect weed characteristics, growth traits, and yield attributes of soybean (*Glycine max*, L., Merrill) cv. Giza111 under Minia Governorate conditions.

MATERIALS AND METHODS

To investigate the effects of tillage system, plant densities, and weed control treatments as well as their interactions on weed characteristics, yield, and its attributes of soybean (*Glycine max*, L., Merrill) cv. Giza111, two field experiments were carried out at the experimental farm of the Faculty of Agriculture, Minia University, during two successive seasons of 2019 and 2020. Wheat was sown on ridges in both seasons as the previous crop. This work was performed using the split-split-plot design with three replicates. The main plots (A) include two methods of tillage system treatments (no tillage and full tillage), while three plant population density (140.000, 186.666 and 210.000 plants/fed.) filled the sub-plots (B), and the five weed control treatments [Select super 250 ml/fed. + Basagran 750 ml/fed. (35 DAS), Select super 250 ml/fed. (35 DAS) + Basagran 750 ml/fed. (50 DAS), Select super 500 ml/fed. + Basagran 750 ml/fed. (35 DAS), Select super 500 ml/fed. (35 DAS) + Basagran 750 ml/fed. (50 DAS), and hand hoeing twice (35 and 50 DAS)] occupied the sub-sub-plots (C). Each experimental plot had five ridges that were each four meters long, spaced 60 cm apart, occupying an area of 12 m^2 (1/350 feddan). On May 15th, in both seasons, dry method sowing (Afir) was carried out on hills on either side of ridges. After sowing, irrigation began right away, with the first irrigation occurring 15 days later. Before the initial irrigation, seedlings were thinned to 2 plants per hill. At preparing the soil for planting, 150 kg/fed. of calcium superphosphate with a 15.5% P_2O_5 was supplied. Before sowing soybean seeds, *Bradyrhizobuim japonicum* was used to inoculate the seeds. Nitrogen fertilizer was applied as a starter dosage at a rate of 15 kg N/fed. in the form of urea 46% after sowing. Physical and chemical analysis of the experimental soil during the two seasons of 2019 and 2020 were performed according to **Chapman and Pratt (1961)** and presented in Table (1).

Data recorded:

In each season, five plants were randomly selected from the second ridge in each sub-sub-plot to collect the following data: plant height (cm) at 45 and 65 DAS; branches number at 65 DAS; plant dry weight (g) at 45 and 65 DAS; leaf area/plant (cm^2) at 45 and 65 DAS using the following equation (plant leaf area cm^2/plant ground area cm^2) disk method of **Johnson (1967)**; leaf area index; and weeds (narrow, wide and total) dry weight (g) at 65 DAS.

Statistical analysis:

All data from each season were properly statistically analyzed in accordance with the protocols described by **Steel and Torrie (1980)**. The Least Significant Differences test (L.S.D.) was used to examine the differences between treatment means at a level of 5% probability.

RESULTS

1. Plant height (cm):

The means of plant height at 45 and 65 days after sowing (DAS) as affected by tillage system, plant densities, weed control treatments, and their interactions

in the 2019 and 2020 seasons, are shown in Tables (2 and 3).

The results of the analysis of variance showed that the tillage system had a highly significant impact on plant height at ages of 45 and 65 DAS in the 2019 season, as well as 65 DAS in the 2020 season.

According to Tables 2 and 3, no-till sowing outperformed full-till sowing for plant height at 45 DAS in both 2019 and 2020 growing seasons, with no discernible difference between them in the second season. However, the opposite trend held true at 65 days age in the first season. Full-till seeding generally resulted in taller plants than no-till sowing. These results can be linked to no-till sowing's impact on soil upkeep (water and nutrients) and losses due to erosion, which had an impact on the vigor of seedling growth and, in turn, plant height. These results are in agreement with those obtained by **Vetsch *et al* (2007)** and **Acharya *et al.* (2019).**

Plant population densities had a significant impact on plant height at 45 and 65 days throughout the 2019 and 2020 growing seasons. Data from Tables 2 and 3 clearly showed that plant height increased gradually and dramatically as plant population densities increased, from 140000 to 210000 plant/fed. at various plant ages in both seasons. The tallest plants were generated with sowing at plant density of 210000 plant/fed, followed with significant differences, by those planted at 186666 plant/fed. The shortest plants were recorded with sowing at plant density of 140000 plant/fed. This pattern persisted at the two investigated ages in both seasons. This is mainly because dense plants have lower light levels inside their canopy, which promotes the synthesis of IAA in stem tissues. As a result, it is possible to anticipate a rise in stem cell elongation and division, which affects plant height. These results are in agreement with those obtained by **Hassan (2015) and Kale *et al.* (2015)**.

Highly significant changes in plant height caused by weed control treatments were detected at the two sampling ages in 2020 season, in addition to 65 DAS in 2019 season, as shown in Tables 2 and 3.

The tallest plants were recorded for hand hoeing twice (35 and 50 DAS) at age 65 days in the first season, whereas the shortest ones were produced in plots received Select super 250 ml/fed. + Basagran 750 ml/fed. (35 DAS)at 65 days in both season. Moreover, the tallest plants were found in plots that received Select super 500 ml/fed. (35 DAS) plus Basagran 750 ml/fed. (50 DAS) at 45 days age in both seasons. These outcomes may be linked to the herbicide's involvement in weed control, which allows soybean plants to grow more successfully and, as a result, increases plant vigor, size, and height. These results are in agreement with those obtained by **Singh *et al.* (2006), Shete *et al.* (2007)** and **Kale *et al.* (2015)**.

Concerning the interactions effect among studied factors on plant height at different ages in both seasons, it could by concluded that the tillage system X plant density interaction had a highly significant impact on plant height at both 45 and 65 DAS in the 2020 season with 210000 plants per fed. Full-till produced the tallest plants, while no-till with 140000 plants per fed. Recorded the shortest plants at 65 days in 2020.

The interaction between the tillage system and the weed control treatments had a significant impact on this trait at 65 DAS in 2019 season, and a highly significant effect at 45 days in 2020 season. The tallest plants were observed at 65 days in the first season for plots received full-till with hand hoeing twice at 35 and 50 DAS, whereas the shortest plants were observed at 65 days in the first and second seasons for full-tilled plots received Select super 250 ml/fed. + Basagran 750 ml (35 DAS).

The interaction between plant density and weed management treatments had a highly significant effect on plant height at both sampling ages in the 2019 season as well as at 45 days age in the 2020 season. Most often, sowing 210000 plants/fed. with adding Select super 500 ml/fed. (35 DAS) + Basagran 750 ml/fed. (50 DAS) resulted in the tallest plants, whereas pots sown with 140000 plants/fed. and receiving Select super 250 ml/fed. + Basagran 750 ml/fed. (35 DAS) produced the shortest plants.

The plant height at 45 days of age in the 2019 season, as well as at 45 and 65 days of age in the 2020 season, was significantly affected by the second order of interaction among the factors under study. While full-till plots sown at 140000 plants/fed. and treated with Select super 500 ml/fed. + Basagran 750 ml/fed. (35 DAS) produced the shortest plants, however, plots sown at 210000 plants/fed. and treated with Select super 500 ml/fed. (35 DAS) + Basagran 750 ml/fed. (50 DAS) under full-till or no-till produced the tallest plants. At different sampling ages in both seasons, other kinds of interactions did not have a discernible impact on this feature.

2. Number of branches per plant:

It is clear that from the findings in Table 4 that the number of branches per plant at 65 (DAS) in both seasons did not significantly affected by tillage system.

No-till seeding produced fewer branches per plant than full-till sowing at 65 DAS in both seasons, as shown in Table (4). However, full-till sowing increased the number of branches/plants in tested age in 2019 and 2020 seasons. Our results might be explained by the impact of tillage on soil qualities, the improvement in ventilation, the creation of a suitable bed for soybean plants, and the provision of sufficient moisture for plant growth and lateral branching. **Vetsch et al. (2007) and Acharya et al. (2019)** both stressed on the benefit of tillage on branches number plant$^{-1.}$

Regarding the effect of plant population densities on branch number plant^{-1}, it was significant at the age of 65 days in the first season (2019). Branch number plant^{-1} at 65 days age in both seasons was decreased with increased plant population densities, from 140000 to 210000 plant/fed. (Table 4). It's noteworthy to note that growing soybeans at a plant population density of 140000 plants per fed. produced the higher branches per plant, followed by those sown at 186666 plants per fed. with significantly different between them, and those at 210000 plants per fed. produced the lowest in both seasons. This is primarily explained by the fact that population density influences how plants compete with one another for resources like light, water, and nutrients, which is crucial for healthy plant development, dry matter accumulation, and yield (grains) production. Because of this, it provides for enough levels of

light, air, moisture, and nutrients, which promotes the growth of branches within the low population density. Our findings are consistent with those from **Hafiz (2005), and Kale *et al.* (2015)**.

According to Table (4), weed control treatments had no appreciable impact on the number of branches per plant at 65 DAS either in 2019 or 2020 growing seasons. In 65 days age in the first season, hand hoeing twice at 35 and 50 DAS generated the highest number of branches (1.39), whilst the fewest branches (1.11) were given with those sprayed with Select Super (500 ml/fed.) + Basagran (750 ml/fed.) at 35 DAS. However, in the second season, plots treated with Select super (500 ml/fed.) at 35 DAS + Basagran 750 (ml/fed.) at 50 DAS recorded the highest branches per plant (1.72), whilst plots treated with Select super (500 ml)+ Basagran(750 ml) (35 DAS) was noted to have the fewest (1.33). Our findings are in acceptance with those gathered by **Singh *et al.* (2006), Samarajeewa *et al.* (2006), Shete *et al.* (2007), Bahram and Reza (2013), Hassan (2015)** and **Manjunath and Hosmath (2016).**

Regarding the influence of interactions among tested factors on the number of branches/plant, it was observed that all interactions among tested factors at 65 days age in both seasons did not demonstrate any significant effect on this trait.

3. Leaf area (cm^2):

Data from Tables 5 and 6 show the means of leaf area/plant as influenced by two tillage systems, three plant population densities, and five weed control treatments, as well as their interactions at ages of 45 and 65 days during 2019 and 2020 seasons.

The results of the analysis of variance showed that the tillage system had no significant influence on this feature at the tested ages of 45 and 65 DAS in either season, with the exception of 65 DAS in the first season.

Tables (5 and 6) show that full-till sowing outperformed no-till sowing for leaf area at the ages of 45 and 65 DAS in both of the 2019 and 2020 experimental seasons. These findings concur with those mentioned by **Samarajeewa *et al.* (2006), Vetsch *et al.* (2007) and Acharya *et al.* (2019)**.

At the age of 45 days in the 2019 and 2020 growing seasons, the effect of plant population densities on leaf area/plant was significant; however, at the age of 65 days, it did not show a significant effect in both seasons. As shown by the data in Tables 5 and 6, at 45 DAS, increasing plant population densities from 140000 to 186666 plant/fed. resulted in a considerable reduction in leaf area in both seasons. In contrast, raising plant population densities from 186666 to 210000 plant/fed. only slightly increased leaf area in the first season; however, this gain was not significant in the second season. It's important to note that cultivating soybean at a plant density of 210000 plants per fed. resulted in the first season's largest leaves for the assessed age of 45 DAS. However, sowing at 140000 plants/fed. had the largest leaves in the second season for the tested age of 45 DAS as well as at the age of 65 DAS in both seasons. This is mostly because low densities allow for enough levels of light, air, moisture, and nutrients, which in turn promotes the

growth and development of leaves. These results are in agreement with those reported by **Cox and Cherney (2011)** and **Gaspar and Conley (2015)**.

No significant variations in leaf area/plant as a result of weed control treatments were seen at the two sample ages of 45 and 65 DAS in both seasons, with the exception of 65 DAS in the first season, as shown in Tables (5 and 6).

The plots that received Basagran (750 ml/fed.) at 50 DAS + Select super (500 ml/fed.) at 35 DAS had the highest leaf area/plant at age 45 DAS in both seasons. While the lowest leaf area/plant resulted from plots that practiced manual hoeing twice (at 35 and 50 DAS) in the first season, in both season at age 65 DAS, the lowest leaf area/plant resulted from plots received Select super (250 ml/fed.) at 35 DAS + Basagran (750 ml/fed.) at 50 DAS. Although the plots that received Select super 500 ml/fed. + Basagran 750 ml/fed. (35 DAS) produced the greatest leaf area/plant at the age of 65 DAS in the 2019 season, the largest ones in 2020 were recorded for plots that received hand hoeing twice (at 35 and 50 DAS)at age 65 DAS. On the other hand, plots that received Select super (250 ml/fed.) plus Basagran (750 ml/fed.) at 35 DAS generated the lowest leaf area/plant in both seasons. These findings may be related to the herbicide's involvement in weed control, which allows soybean plants to develop more successfully and, as a result, increases plant vigor and size, including leaf area. Our findings are in agreement with those obtained by **Samarajeewa *et al.* (2006)** and **Shete *et al.* (2007).**

It was possible to draw the conclusion that the interaction between the studied factors (tillage system and plant densities) had a significant impact on leaf area/plant only at the age of 45 DAS in the first season. However, at 65 DAS in both seasons and 45 DAS in the second season, the interaction effect between the tillage system and plant density was not statistically significant. It was clear that the full-till treatment with 140000 plants per fed. produced the highest leaf area/plant, whereas the full-till treatment with 186666 plants per fed. produced the lowest leaf area/plant.

At the two sampling ages in both seasons, none of the other types of interactions among the studied factors that affected leaf area did not exert a significant impact on this trait.

4. Leaf area index (LAI):

The means of leaf area index at ages of 45 and 65 DAS in the 2019 and 2020 seasons as affected by tillage strategies, plant population densities, weed control treatments, and their interactions, Tables (7 and 8).

The results of the analysis of variance showed that the tillage system had no significant impact on the leaf area index at ages 45 in both seasons as well as at 65 DAS in 2020 growing season. On the other hand, for DAS 65, the impact of the tillage system on the leaf area index was significant in 2019. For the treatment of full-till, the maximum LAI values were obtained at 45 and 65 DAS in both seasons. In the first and second seasons, respectively, this better treatment provided 9.56 and 10.96% above the no-till treatment for the age of 45 DAS and 19.14 and 14.53% over the no-till treatment for the age of 65 DAS. These results would have been anticipated given the rise in the leaf area index brought on by the tillage influence on leaf area.

At 45 and 65 days in the 2019 and 2020 seasons, the effect of plant population densities on leaf area index was highly significant. With increasing plant densities, from 140000 to 210000 plant/fed. at different ages (45 and 65 DAS) in both seasons, LAI was clearly and considerably reduced, according to data in Tables (7 and 8). It is interesting to note that the highest LAI values were obtained by sowing at a plant density of 140000 plants per fed., followed by those sown at 186666 plants per fed., with significant differences, while the lowest ones were obtained by sowing 210000 plants per fed. At the two investigated ages of 45 and 65 DAS in both seasons, this trend persisted. This is mainly because dense plants have lower light levels inside their canopy, which promotes the synthesis of IAA in stem tissues. Therefore, an increase in stem cell proliferation and elongation could be anticipated, which will have an impact on the plant's leaf area and, ultimately, LAI. These findings concur with those reported by **Murilo *et al*. (2022), and Cox and Cherney (2011)**.

The results of the 45 DAS sample age in both of 2019 and 2020 seasons, did not reveal any appreciable variations in LAI as a result of weed control treatments, as shown in Tables (7 and 8). However, weed control at 65 days in 2019 and 2020 had a significant impact on this trait. The plots that received Select super (500 ml/fed.) at 35 days after planting with Basagran (750 ml/fed.) at 50 DAS gave the highest values of LAI at the age of 45 days in both seasons. Additionally, with manual hoeing twice at 35 and 50 DAS at the age of 65 days in both seasons, the highest values were noted. These outcomes may be linked to the role of herbicide in eradicating weeds, allowing soybean plants to develop more vigorously and larger, including more leaf area per plant, which has an impact on LAI.

It was interesting to observe that the tillage system X plant densities interaction had a significant impact on LAI at the age of 45 DAS in just the first season with regard to the effects of interactions among the investigated factors on LAI. In the 2019 season at 45 days, full-till with 140000 plants/fed. had the highest values, on contrast, no-till with 210000 plants/fed. had the lowest values.

At the two sampling ages (45 and 65 DAS) in both seasons, no significant effects of any other types of interactions among the studied factors on LAI were seen.

5. Weed characters:

The data in Tables (9, 10 and 11) reveal the average dry weight of weeds (narrow, broad and total weeds/g/m^2) at 65 DAS for both the 2019 and 2020 experimental seasons, as affected by tillage system, plant densities, weed control treatments, and their interactions. The statistical analysis showed that the tillage system 2019 and 2020 seasons exhibited significant influence on the dry weight of narrow leaves weed, significant effect on dry weight of broad leaves weed in 2019 season, and significant impact on total weeds dry weight in both seasons.

In both growing seasons, no-till sowing was surpassed full-till sowing for the dry weight of all kind of weeds (g/m^2) at age 65 DAS, with no

appreciable difference between them. In every instance, full-till sowing resulted in a lighter dry weight of narrow leaf weed than no-till sowing. These findings are in agreement with those made by **Samarajeewa *et al.* (2006) and Mishra and Singh (2005)**.

At the age of 65 days in the 2019 and 2020 seasons, the effect of plant population densities on the dry weight of all kind weeds (g/m^2) was highly significant. According to data in Tables (9, 10 and 11), the dry weight of all weeds were decreased dramatically and gradually as plant population density increased, from 140000 to 210000 plants per fed. in both seasons. It's noteworthy to note that decreasing weeds (narrow broad and total weeds) dry weights coincided with rising plant densities. The population density of 140000 plant/fed was found to have the highest values, and the opposite was true with 210000 plants/fed. This research's findings are consistent with those of **Soliman *et al.* (2015) and Menalled *et al.* (2022).**

According to Tables (9, 10 and 11), there were no appreciable variations among weed control treatments on the dry weight of weeds (narrow, broad and total weeds) in the two seasons. The heaviest dry weight of the three tested traits (g/m^2) were recorded for plots received Select super (500 ml/fed.) + Basagran (750 ml/fed.) at 35 DAS. These results are in the line with those mentioned by **Singh *et al.* (2006), Shete *et al.* (2007), Sangeetha *et al.* (2013), Mohajer *et al.* (2015), Bali *et al.* (2016)** and **Paudel *et al.* (2017)**.

It was noticeable to see that the tillage system X plant densities interaction had a significant impact on the dry weight of the three examined weed parameters at the age of 65 DAS in the 2019 and 2020 seasons. In both growing seasons, no-till sowing with 140000 plants per fed. recorded the heaviest dry weights of weeds, while full-till crops with 210000 plants per fed. recorded the lightest ones.

All types of interactions among the tested factors on the dry weights of narrow, broad leaves and total weeds did not observe any significant effect in this concern.

CONCLUSION

For the best growth (plant height, number of branches, leaf area and leaf area index) of soybean plant as well as good management of weed control, it could be recommended that the soil should be plowed before cultivation, sowing with plants at a rate of 210.000 plants/fed. and spraying plants with Select super (500 ml/fed.) at 35 DAS + Basagran 750 (ml/fed.) at 50 DAS under experimental area condition of Minia Governorate.

For the best productivity of soybean per unit area, it could be recommended that the soil should be plowed before cultivation, sowing plants at a rate of 210.000 plants/fed. and spraying plants with Select super (500 ml/fed.) at 35 DAS + Basagran 750 (ml/fed.) at 50 DAS under experimental area condition of Minia Governorate.

Table (1): Mechanical and chemical analyses of the surface soil at the experimental site in both growing seasons.

Soil character	Values	
	The 1st season (2019)	The 2nd season (2020)
Mechanical analysis		
Sand (%)	22.43	22.12
Silt (%)	30.59	31.13
Clay (%)	46.98	46.75
Soil texture	**Clay loam**	**Clay loam**
Chemical analysis		
Soil reaction pH	8.05	8.03
E.C. (m mohs/cm)	0.346	0.349
Organic matter (%)	1.46	1.47
Total nitrogen (%)	0.09	0.08
Available P (ppm)	21.3	21.1
Available K (ppm)	346.4	349.3

Table (2): Means of plant height (cm) at ages of 45 and 65 days as affected by tillage system, plant density, weed control treatments and their interaction in 2019 season.

Tillage system	Plant density	Age of 45 days						Age of 65 days					
		Weed control treatments					Mean	Weed control treatments					Mean
		C1	C2	C3	C4	C5		C1	C2	C3	C4	C5	
No till	B1	26.80	25.26	29.01	30.89	31.67	**28.73**	41.77	39.67	44.57	47.83	57.17	**46.20**
	B2	31.05	29.00	30.00	28.67	28.67	**29.48**	56.70	50.50	50.17	48.53	49.23	**51.03**
	B3	32.07	31.33	30.67	29.33	30.33	**30.75**	54.83	61.13	59.50	64.63	49.47	**57.91**
Mean		**29.97**	**28.53**	**29.89**	**29.63**	**30.22**	**29.65**	**51.10**	**50.43**	**51.41**	**53.67**	**51.96**	**51.71**
Full till	B1	28.67	29.73	27.67	27.67	27.33	**28.21**	44.80	49.47	47.83	50.17	54.83	**49.42**
	B2	31.33	29.00	29.33	28.67	29.33	**29.53**	51.80	57.17	58.80	56.00	59.97	**56.75**
	B3	27.67	27.33	28.33	32.67	28.67	**28.93**	43.97	65.17	59.50	67.67	71.63	**61.59**
Mean		**29.22**	**28.69**	**28.44**	**29.67**	**28.44**	**28.89**	**46.86**	**57.27**	**55.38**	**57.94**	**62.14**	**55.92**
Mean of B	B1	**27.73**	**27.50**	**28.34**	**29.28**	**29.50**	**28.47**	**43.28**	**44.57**	**46.20**	**49.00**	**56.00**	**47.81**
	B2	**31.19**	**29.00**	**29.67**	**28.67**	**29.00**	**29.50**	**54.25**	**53.83**	**54.48**	**52.27**	**54.60**	**53.89**
	B3	**29.87**	**29.33**	**29.50**	**31.00**	**29.50**	**29.84**	**49.40**	**63.15**	**59.50**	**66.15**	**60.55**	**59.75**
Mean of C		**29.60**	**28.61**	**29.17**	**29.65**	**29.33**	**29.27**	**48.98**	**53.85**	**53.39**	**55.81**	**57.05**	**53.82**
L.S.D. at 5%		**A:** 0.497**			**AB:** NS			**A:** 2.568**			**AB:** NS		
		B: 0.918**			**AC:** NS			**B:** 5.863**			**AC:** 6.162*		
		C: NS			**BC:** 1.746**			**C:** 4.784**			**BC:** 9.022**		
					ABC: 2.389**						**ABC:** NS		

Where: **b1**: 140.000 plant/fed., **b2**: 186.666 plant/fed. and **b3**: 210.000 plant/fed.

C1: Select super (250 ml) + Basagran (750 ml) (35 DAS), C2: Select super (250 ml) (35 DAS) + Basagran (750 ml) (50 DAS), C3: Select super (500 ml) + Basagran (750 ml) (35 DAS), C4: Select super (500 ml) (35 DAS) + Basagran (750 ml) (50 DAS) and C5: hand hoeing twice (35 and 50 DAS)

Table (3): Means of plant height (cm) at ages of 45 and 65 days as affected by tillage system, plant density, weed control treatments and their interaction in 2020 season.

Tillage system	Plant density	Age of 45 days						Age of 65 days					
		Weed control treatments					Mean	Weed control treatments					Mean
		C1	C2	C3	C4	C5		C1	C2	C3	C4	C5	
No till	B1	37.51	35.37	40.40	41.27	40.03	**38.92**	50.00	51.00	50.50	51.25	51.75	**50.90**
	B2	41.10	35.97	38.30	36.37	38.10	**37.97**	50.00	58.25	60.25	57.50	56.00	**56.40**
	B3	41.27	40.33	38.97	41.17	41.57	**40.66**	65.25	63.25	62.25	66.50	57.25	**62.90**
Mean		**39.96**	**37.22**	**39.22**	**39.60**	**39.90**	**39.18**	**55.08**	**57.50**	**57.67**	**58.42**	**55.00**	**56.73**
Full till	B1	36.40	38.57	35.27	36.87	36.50	**36.72**	48.00	50.75	53.50	51.00	52.25	**51.10**
	B2	40.77	39.30	40.97	38.73	38.53	**39.66**	51.75	51.00	51.75	53.00	51.25	**51.75**
	B3	36.67	36.30	39.00	42.13	37.73	**38.37**	62.25	65.25	64.50	63.75	66.00	**64.35**
Mean		**37.94**	**38.06**	**38.41**	**39.24**	**37.59**	**38.25**	**54.00**	**55.67**	**56.58**	**55.92**	**56.50**	**55.73**
Mean of B	B1	**36.95**	**36.97**	**37.83**	**39.07**	**38.27**	**37.82**	**49.00**	**50.88**	**52.00**	**51.13**	**52.00**	**51.00**
	B2	**40.93**	**37.63**	**39.63**	**37.55**	**38.32**	**38.81**	**50.88**	**54.63**	**56.00**	**55.25**	**53.62**	**54.08**
	B3	**36.67**	**36.30**	**39.00**	**42.13**	**37.73**	**39.51**	**63.75**	**64.25**	**63.38**	**65.12**	**61.62**	**63.62**
Mean of C		**38.95**	**37.64**	**38.82**	**39.42**	**38.74**	**38.71**	**54.54**	**56.58**	**57.12**	**57.17**	**55.75**	**56.23**
L.S.D. at 5%		**A: NS** **B:** 1.012** **C:** 0.996**			**AB:** 1.762** **AC:** 1.791** **BC:** 1.775** **ABC:** 2.641**			**A:** 2.475** **B:** 1.860** **C:** 1.798**			**AB:** 2.451** **AC: NS** **BC: NS** **ABC:** 4.497**		

Where: **b1**: 140.000 plant/fed., **b2**: 186.666 plant/fed. and **b3**: 210.000 plant/fed.

C1: Select super (250 ml) + Basagran (750 ml) (35 DAS), C2: Select super (250 ml) (35 DAS) + Basagran (750 ml) (50 DAS), C3: Select super (500 ml) + Basagran (750 ml) (35 DAS), C4: Select super (500 ml) (35 DAS) + Basagran (750 ml) (50 DAS) and C5: hand hoeing twice (35 and 50 DAS).

Table (4): Means of number of branches at age of 65 days as affected by tillage system, plant density, weed control treatments and their interaction in 2019 and 2020 seasons.

Tillage system	Plant density	First season of 2019.						Second season of 2020.					
		Weed control treatments					Mean	Weed control treatments					Mean
		C1	C2	C3	C4	C5		C1	C2	C3	C4	C5	
No till	B1	1.33	1.00	1.00	1.33	1.33	**1.20**	1.67	1.33	1.00	1.67	1.67	**1.47**
	B2	1.33	1.33	1.00	1.00	1.67	**1.27**	1.33	2.00	1.67	1.33	1.67	**1.60**
	B3	1.00	1.00	1.00	1.33	1.00	**1.07**	1.00	1.33	1.00	1.33	1.67	**1.27**
Mean		**1.22**	**1.11**	**1.00**	**1.22**	**1.33**	**1.18**	**1.33**	**1.56**	**1.22**	**1.44**	**1.67**	**1.44**
Full till	B1	1.33	1.33	1.67	1.33	1.67	**1.47**	2.33	2.00	1.67	2.00	2.00	**2.00**
	B2	1.67	1.00	1.00	1.67	1.33	**1.33**	1.67	1.67	1.33	2.67	1.33	**1.73**
	B3	1.33	1.33	1.00	1.00	1.33	**1.20**	2.00	1.67	1.33	1.33	1.33	**1.53**
Mean		**1.44**	**1.22**	**1.22**	**1.33**	**1.44**	**1.33**	**2.00**	**1.78**	**1.44**	**2.00**	**1.56**	**1.76**
Mean of B	B1	**1.33**	**1.17**	**1.33**	**1.33**	**1.50**	**1.33**	**2.00**	**1.67**	**1.33**	**1.83**	**1.83**	**1.73**
	B2	**1.50**	**1.17**	**1.00**	**1.33**	**1.50**	**1.30**	**1.50**	**1.83**	**1.50**	**2.00**	**1.50**	**1.67**
	B3	**1.17**	**1.17**	**1.00**	**1.17**	**1.17**	**1.13**	**1.50**	**1.50**	**1.17**	**1.33**	**1.50**	**1.40**
Mean of C		**1.33**	**1.17**	**1.11**	**1.28**	**1.39**	**1.26**	**1.67**	**1.67**	**1.33**	**1.72**	**1.61**	**1.60**
L.S.D. at 5%		**A:** NS **B:** 0.183* **C:** NS			**AB:** NS **AC:** NS **BC:** NS **ABC:** NS			**A:** NS **B:** NS **C:** NS			**AB:** NS **AC:** NS **BC:** NS **ABC:** NS		

Where: b1: 140.000 plant/fed., b2: 186.666 plant/fed. and b3: 210.000 plant/fed.

C1: Select super (250 ml) + Basagran (750 ml) (35 DAS), C2: Select super (250 ml) (35 DAS) + Basagran (750 ml) (50 DAS), C3: Select super (500 ml) + Basagran (750 ml) (35 DAS), C4: Select super (500 ml) (35 DAS) + Basagran (750 ml) (50 DAS) and C5: hand hoeing twice (35 and 50 DAS).

Table (5): Means of leaf area (cm2) at ages of 45 and 65 days as affected by tillage system, plant density, weed control treatments and their interaction in 2019 season.

Tillage system	Plant density	Age of 45 days						Age of 65 days					
		Weed control treatments					Mean	Weed control treatments					Mean
		C1	C2	C3	C4	C5		C1	C2	C3	C4	C5	
No till	B1	599.99	461.71	504.92	618.06	518.16	**540.57**	934.52	1031.59	1212.82	1178.67	1431.59	**1157.84**
	B2	569.30	537.39	633.08	560.60	515.80	**563.24**	835.23	1541.07	1204.13	1270.75	1499.13	**1270.06**
	B3	618.23	586.03	614.58	613.41	623.95	**611.41**	1294.99	1686.67	1497.67	1491.88	1294.47	**1453.14**
Mean		**595.84**	**828.38**	**584.19**	**597.36**	**552.64**	**571.68**	**1021.58**	**1419.78**	**1304.87**	**1313.77**	**1408.40**	**1293.68**
Full till	B1	632.07	703.17	675.94	716.13	626.50	**670.76**	1477.68	1627.98	1535.36	1695.51	1679.88	**1603.38**
	B2	518.52	528.67	504.08	529.02	525.51	**521.16**	1215.28	1217.66	1625.60	1392.57	1558.20	**1401.86**
	B3	619.32	799.54	635.45	596.23	641.49	**638.41**	1474.58	1653.82	1766.79	981.60	1259.56	**1427.42**
Mean		**589.97**	**643.79**	**605.16**	**613.79**	**597.83**	**610.11**	**1389.18**	**1499.82**	**1642.58**	**1356.56**	**1499.21**	**1477.47**
Mean of B	B1	**616.03**	**582.44**	**590.43**	**667.10**	**572.33**	**605.67**	**1206.10**	**1329.78**	**1374.10**	**1437.09**	**1555.74**	**1380.56**
	B2	**543.61**	**533.03**	**568.58**	**544.81**	**520.65**	**542.20**	**1025.25**	**1379.37**	**1414.86**	**1331.66**	**1528.67**	**1335.96**
	B3	**618.77**	**642.79**	**625.02**	**604.82**	**632.72**	**624.82**	**1384.79**	**1670.24**	**1632.23**	**1236.74**	**1277.01**	**1440.20**
Mean of C		**592.91**	**586.09**	**594.68**	**605.58**	**575.24**	**590.90**	**1205.38**	**1459.80**	**1473.73**	**1335.17**	**1453.81**	**1385.58**
L.S.D. at 5%		**A**: NS **B**: 51.556* **C**: NS			**AB**: 70.175** **AC**: NS **BC**: NS **ABC**: NS			**A**: 204.176* **B**: NS **C**: 220.320			**AB**: NS **AC**: NS **BC**: NS **ABC**: NS		

Where: b1: 140.000 plant/fed., b2: 186.666 plant/fed. and b3: 210.000 plant/fed.

C1: Select super (250 ml) + Basagran (750 ml) (35 DAS), C2: Select super (250 ml) (35 DAS) + Basagran (750 ml) (50 DAS), C3: Select super (500 ml) + Basagran (750 ml) (35 DAS), C4: Select super (500 ml) (35 DAS) + Basagran (750 ml) (50 DAS) and C5: hand hoeing twice (35 and 50 DAS).

Table (6): Means of leaf area (cm2) at ages of 45 and 65 days as affected by tillage system, plant density, weed control treatments and their interaction 2020 season.

Tillage system	Plant density	Age of 45 days						Age of 65 days					
		Weed control treatments					Mean	Weed control treatments					Mean
		C1	C2	C3	C4	C5		C1	C2	C3	C4	C5	
No till	B1	973.96	956.19	914.00	1212.18	1142.08	**1039.68**	1590.74	1683.85	1817.71	1598.16	1792.64	**1696.62**
	B2	805.64	764.76	1122.73	931.87	787.31	**882.46**	1354.82	1742.13	1631.88	1645.47	1685.15	**1611.59**
	B3	832.73	729.12	818.29	877.28	972.10	**845.90**	1660.69	1779.59	1664.30	1754.56	1939.88	**1759.80**
Mean		**870.78**	**816.69**	**951.68**	**1007.11**	**967.16**	**922.68**	**1535.42**	**1735.19**	**1704.63**	**1666.06**	**1825.89**	**1689.44**
Full till	B1	1165.44	1102.04	1206.07	1327.15	1053.08	**1170.75**	1941.15	1962.33	1931.88	1994.65	1944.33	**1954.87**
	B2	901.00	970.71	998.39	973.95	1006.34	**970.08**	1820.75	1824.60	1984.60	2087.62	2335.89	**2010.69**
	B3	906.18	968.96	838.84	896.05	951.40	**912.29**	1884.72	1976.15	1672.86	1470.71	1887.33	**1778.35**
Mean		**990.87**	**1013.90**	**1014.43**	**1066.71**	**1003.61**	**1017.71**	**1882.21**	**1921.03**	**1863.11**	**1805.99**	**2055.85**	**1914.64**
Mean of B	B1	**1069.70**	**1029.11**	**1060.03**	**1269.66**	**1097.58**	**1105.22**	**1765.95**	**1823.09**	**1874.80**	**1796.41**	**1868.48**	**1825.74**
	B2	**853.32**	**867.73**	**1060.56**	**952.91**	**896.82**	**926.27**	**1587.79**	**1783.37**	**1808.24**	**1866.55**	**2010.52**	**1811.29**
	B3	**869.46**	**849.04**	**828.57**	**886.66**	**961.75**	**879.10**	**1772.71**	**1877.87**	**1668.58**	**1612.63**	**1913.61**	**1769.08**
Mean of C		**930.83**	**915.30**	**983.05**	**1036.41**	**985.38**	**970.19**	**1708.81**	**1828.11**	**1783.87**	**1758.53**	**1930.87**	**1802.04**
L.S.D. 5%		**A**: NS **B**: 185.781* **C**: NS			**AB**: NS **AC**: NS **BC**: NS **ABC**: NS			**A**: NS **B**: NS **C**: NS			**AB**: NS **AC**: NS **BC**: NS **ABC**: NS		

Where: **b1**: 140.000 plant/fed., **b2**: 186.666 plant/fed. and **b3**: 210.000 plant/fed.

C1: Select super (250 ml) + Basagran (750 ml) (35 DAS), **C2**: Select super (250 ml) (35 DAS) + Basagran (750 ml) (50 DAS), **C3**: Select super (500 ml) + Basagran (750 ml) (35 DAS), **C4**: Select super (500 ml) (35 DAS) + Basagran (750 ml) (50 DAS) and C5: hand hoeing twice (35 and 50 DAS).

Table (7): Means of leaf area index at ages of 45 and 65 days as affected by tillage system, plant density, weed control treatments and their interaction in 2019 season.

Tillage system	Plant density	Age of 45 days						Age of 65 days					
		Weed control treatments					Mean	Weed control treatments					Mean
		C1	C2	C3	C4	C5		C1	C2	C3	C4	C5	
No till	B1	2.00	1.54	1.86	2.06	1.73	**1.80**	3.12	3.44	4.04	3.93	4.77	**3.86**
	B2	1.27	1.19	1.41	1.25	1.15	**1.25**	1.86	3.42	2.68	2.82	3.33	**2.82**
	B3	1.03	0.98	1.02	1.02	1.04	**1.02**	2.16	2.81	2.50	2.49	2.16	**2.42**
Mean		**1.43**	**1.24**	**1.37**	**1.44**	**1.30**	**1.36**	**2.38**	**3.22**	**3.07**	**3.08**	**3.42**	**3.03**
Full till	B1	2.11	2.34	2.25	2.39	2.09	**2.24**	4.93	5.43	5.12	5.65	5.60	**5.34**
	B2	1.15	1.17	1.12	1.18	1.17	**1.16**	2.70	2.71	3.61	3.09	3.46	**3.12**
	B3	1.03	1.17	1.06	0.99	1.07	**1.06**	2.46	2.76	2.94	1.64	2.10	**2.38**
Mean		**1.43**	**1.56**	**1.48**	**1.52**	**1.44**	**1.49**	**3.36**	**3.63**	**3.89**	**3.46**	**3.72**	**3.61**
Mean of B	**B1**	**2.05**	**1.94**	**1.97**	**2.22**	**1.91**	**2.02**	**4.02**	**4.43**	**4.58**	**4.79**	**5.19**	**4.60**
	B2	**1.21**	**1.18**	**1.26**	**1.21**	**1.16**	**1.20**	**2.28**	**3.07**	**3.14**	**2.96**	**3.40**	**2.97**
	B3	**1.03**	**1.07**	**1.04**	**1.01**	**1.05**	**1.04**	**2.31**	**2.78**	**2.72**	**2.06**	**2.13**	**2.40**
Mean of C		**1.43**	**1.40**	**1.42**	**1.48**	**1.37**	**1.42**	**2.87**	**3.43**	**3.48**	**3.27**	**3.57**	**3.32**
L.S.D. at 5%		**A**: NS **B**: 0.152** **C**: NS			**AB**: 0.204* **AC**: NS **BC**: NS **ABC**: NS			**A**: 0.146** **B**: 1.135** **C**: 0.500*			**AB**: NS **AC**: NS **BC**: NS **ABC**: NS		

Where: **b1**: 140.000 plant/fed., **b2**: 186.666 plant/fed. and **b3**: 210.000 plant/fed.

C1: Select super (250 ml) + Basagran (750 ml) (35 DAS), C2: Select super (250 ml) (35 DAS) + Basagran (750 ml) (50 DAS), C3: Select super (500 ml) + Basagran (750 ml) (35 DAS), C4: Select super (500 ml) (35 DAS) + Basagran (750 ml) (50 DAS) and C5: hand hoeing twice (35 and 50 DAS).

Table (8): Means of leaf area index at ages of 45 and 65 days as affected by tillage system, plant density, weed control treatments and their interaction in 2020 season.

Tillage system	Plant density	Age of 45 days						Age of 65 days					
		Weed control treatments					Mean	Weed control treatments					Mean
		C1	C2	C3	C4	C5		C1	C2	C3	C4	C5	
No till	B1	3.25	3.19	3.05	4.04	3.81	**3.47**	5.30	5.61	6.06	5.33	5.98	**5.66**
	B2	1.79	1.70	2.49	2.07	1.75	**1.96**	3.01	3.87	3.63	3.66	3.74	**3.58**
	B3	1.39	1.22	1.36	1.46	1.62	**1.41**	2.77	2.97	2.77	2.92	3.23	**2.93**
Mean		**2.14**	**2.03**	**2.30**	**2.52**	**2.39**	**2.28**	**3.69**	**4.15**	**4.15**	**3.97**	**4.32**	**4.06**
Full till	B1	3.88	3.67	4.02	4.42	3.51	**3.90**	6.47	6.54	6.44	6.65	6.48	**6.52**
	B2	2.00	2.16	2.22	2.16	2.24	**2.16**	4.05	4.05	4.41	4.64	5.19	**4.47**
	B3	1.51	1.61	1.40	1.49	1.59	**1.52**	3.14	3.29	2.79	2.45	3.15	**2.96**
Mean		**2.47**	**2.48**	**2.55**	**2.69**	**2.44**	**2.53**	**4.55**	**4.63**	**4.55**	**4.58**	**4.94**	**4.65**
Mean of B	B1	**3.57**	**3.43**	**3.53**	**4.23**	**3.66**	**3.68**	**5.89**	**6.08**	**6.25**	**5.99**	**6.23**	**6.09**
	B2	**1.90**	**1.93**	**2.36**	**2.12**	**1.99**	**2.06**	**3.53**	**3.96**	**4.02**	**4.15**	**4.47**	**4.03**
	B3	**1.45**	**1.42**	**1.38**	**1.48**	**1.60**	**1.47**	**2.95**	**3.13**	**2.78**	**2.69**	**3.19**	**2.95**
Mean of C		**2.30**	**2.26**	**2.42**	**2.61**	**2.42**	**2.40**	**4.12**	**4.39**	**4.35**	**4.27**	**4.63**	**4.35**
L.S.D. at 5%		**A**: NS **B**: 0.572** **C**: NS			**AB**: NS **AC**: NS **BC**: NS **ABC**: NS			**A**: NS **B**: 0.730** **C**: 0.500*			**AB**: NS **AC**: NS **BC**: NS **ABC**: NS		

Where: **b1**: 140.000 plant/fed., **b2**: 186.666 plant/fed. and **b3**: 210.000 plant/fed.

C1: Select super (250 ml) + Basagran (750 ml) (35 DAS), C2: Select super (250 ml) (35 DAS) + Basagran (750 ml) (50 DAS), C3: Select super (500 ml) + Basagran (750 ml) (35 DAS), C4: Select super (500 ml) (35 DAS) + Basagran (750 ml) (50 DAS) and C5: hand hoeing twice (35 and 50 DAS).

Table (9): Means of narrow weed dry weight (g) at 65 days as affected by tillage system, plant density, weed control treatments and their interaction in 2019 and 2020 seasons.

Tillage system	Plant density	First season of 2019.						Second season of 2020.					
		Weed control treatments					Mean	Weed control treatments					Mean
		C1	C2	C3	C4	C5		C1	C2	C3	C4	C5	
No till	B1	3.69	3.73	3.79	3.78	3.67	**3.73**	4.62	4.67	4.73	4.73	4.59	**4.67**
	B2	3.69	3.55	3.70	3.62	2.78	**3.47**	4.61	4.44	4.63	4.53	3.48	**4.34**
	B3	2.45	2.64	2.66	2.37	3.12	**2.65**	3.06	3.31	3.32	2.96	3.90	**3.31**
Mean		**3.28**	**3.31**	**3.38**	**3.26**	**3.19**	**3.28**	**4.09**	**4.14**	**4.23**	**4.07**	**3.99**	**4.10**
Full till	B1	3.96	3.35	3.73	4.29	3.08	**3.68**	4.95	4.19	4.66	5.37	3.84	**4.60**
	B2	2.08	2.69	3.24	2.65	2.49	**2.63**	2.60	3.36	4.05	3.31	3.11	**3.29**
	B3	2.49	2.38	2.41	2.37	3.20	**2.57**	3.11	2.98	3.02	2.96	4.00	**3.21**
Mean		**2.84**	**2.81**	**3.12**	**3.10**	**2.92**	**2.96**	**3.55**	**3.51**	**3.91**	**3.88**	**3.65**	**3.70**
Mean of B	B1	**3.82**	**3.54**	**3.76**	**4.04**	**3.37**	**3.71**	**4.78**	**4.43**	**4.69**	**5.05**	**4.22**	**4.63**
	B2	**2.89**	**3.12**	**3.47**	**3.13**	**2.64**	**3.05**	**3.61**	**3.90**	**4.34**	**3.92**	**3.30**	**3.81**
	B3	**2.47**	**2.51**	**2.54**	**2.37**	**3.16**	**2.61**	**3.08**	**3.14**	**3.17**	**2.96**	**3.95**	**3.26**
Mean of C		**3.06**	**3.06**	**3.25**	**3.18**	**3.06**	**3.12**	**3.82**	**3.82**	**4.07**	**3.98**	**3.82**	**3.90**
L.S.D. at 5%		**A:** 0.340* **B:** 0.360** **C:** NS			**AB:** 0.439* **AC:** NS **BC:** NS **ABC:** NS			**A:** 0.425* **B:** 0.450** **C:** NS			**AB:** 0.548* **AC:** NS **BC:** NS **ABC:** NS		

Where: **b1**: 140.000 plant/fed., **b2**: 186.666 plant/fed. and **b3**: 210.000 plant/fed.

C1: Select super (250 ml) + Basagran (750 ml) (35 DAS), C2: Select super (250 ml) (35 DAS) + Basagran (750 ml) (50 DAS), C3: Select super (500 ml) + Basagran (750 ml) (35 DAS), C4: Select super (500 ml) (35 DAS) + Basagran (750 ml) (50 DAS) and C5: hand hoeing twice (35 and 50 DAS).

Table (10): Means of wide weed dry weight (g) at 65 days as affected by tillage system, plant density, weed control treatments and their interaction in 2019 and 2020 seasons.

Tillage system	Plant density	First season of 2019.						Second season of 2020.					
		Weed control treatments					Mean	Weed control treatments					Mean
		C1	C2	C3	C4	C5		C1	C2	C3	C4	C5	
No till	B1	4.51	4.21	4.31	4.65	4.61	**4.46**	5.47	5.14	5.13	5.61	5.62	**5.40**
	B2	4.29	4.45	4.77	4.53	3.90	**4.39**	5.18	5.26	5.68	5.44	4.62	**5.24**
	B3	3.52	3.22	3.06	3.45	3.95	**3.44**	4.19	3.79	3.49	3.50	3.91	**3.78**
Mean		**4.11**	**3.96**	**4.05**	**4.21**	**4.16**	**4.10**	**4.95**	**4.73**	**4.77**	**4.85**	**4.72**	**4.80**
Full till	B1	3.96	4.37	4.77	4.47	3.46	**4.21**	4.69	5.23	5.56	5.46	4.25	**5.04**
	B2	2.85	3.56	3.96	3.28	2.75	**3.28**	3.36	4.09	4.80	3.94	3.28	**3.89**
	B3	2.87	2.95	2.85	3.02	4.05	**3.15**	3.43	3.58	3.62	3.50	4.88	**3.80**
Mean		**3.23**	**3.63**	**3.86**	**3.59**	**3.42**	**3.55**	**3.82**	**4.30**	**4.66**	**4.30**	**4.14**	**4.24**
Mean of B	B1	**4.24**	**4.29**	**4.54**	**4.56**	**4.04**	**4.33**	**5.08**	**5.18**	**5.34**	**5.54**	**4.94**	**5.22**
	B2	**3.57**	**4.01**	**4.37**	**3.90**	**3.33**	**3.84**	**4.27**	**4.68**	**5.24**	**4.69**	**3.95**	**4.56**
	B3	**3.20**	**3.09**	**2.95**	**3.23**	**4.00**	**3.29**	**3.81**	**3.68**	**3.56**	**3.50**	**4.40**	**3.79**
Mean of C		**3.67**	**3.79**	**3.95**	**3.90**	**3.79**	**3.82**	**4.39**	**4.52**	**4.71**	**4.58**	**4.43**	**4.52**
L.S.D. at 5%		**A:** 0.180* **B:** 0.281** **C:** NS			**AB:** 0.331** **AC:** NS **BC:** 0.715* **ABC:** NS			**A:** NS **B:** 0.457** **C:** NS			**AB:** 0.649* **AC:** NS **BC:** NS **ABC:** NS		

Where: **b1**: 140.000 plant/fed., **b2**: 186.666 plant/fed. and **b3**: 210.000 plant/fed.

C1: Select super (250 ml) + Basagran (750 ml) (35 DAS), C2: Select super (250 ml) (35 DAS) + Basagran (750 ml) (50 DAS), C3: Select super (500 ml) + Basagran (750 ml) (35 DAS), C4: Select super (500 ml) (35 DAS) + Basagran (750 ml) (50 DAS) and C5: hand hoeing twice (35 and 50 DAS).

Table (11): Means of total weed dry weight (g) at 65 days as affected by tillage system, plant density, weed control treatments and their interaction in 2019 and 2020 seasons.

Tillage system	Plant density	First season of 2019.						Second season of 2020.					
		Weed control treatments					Mean	Weed control treatments					Mean
		C1	C2	C3	C4	C5		C1	C2	C3	C4	C5	
No till	B1	8.20	7.94	8.09	8.43	8.28	**8.19**	10.09	9.81	9.86	10.34	10.21	**10.06**
	B2	7.98	8.00	8.48	8.15	6.69	**7.86**	9.79	9.70	10.31	9.97	8.10	**9.57**
	B3	5.97	5.86	5.71	5.82	7.07	**6.09**	7.25	7.10	6.81	6.46	7.82	**7.09**
Mean		**7.38**	**7.27**	**7.43**	**7.47**	**7.35**	**7.38**	**9.04**	**8.87**	**8.99**	**8.92**	**8.71**	**8.91**
Full till	B1	7.92	7.72	8.50	8.76	6.54	**7.89**	9.63	9.42	10.22	10.83	8.10	**9.64**
	B2	4.93	6.25	7.20	5.93	5.24	**5.91**	5.96	7.45	8.84	7.25	6.39	**7.18**
	B3	5.36	5.34	5.27	5.39	7.24	**5.72**	6.54	6.56	6.64	6.47	8.88	**7.02**
Mean		**6.07**	**6.44**	**6.99**	**6.69**	**6.34**	**6.51**	**7.38**	**7.81**	**8.56**	**8.18**	**7.79**	**7.94**
Mean of B	B1	**8.06**	**7.83**	**8.30**	**8.60**	**7.41**	**8.04**	**9.86**	**9.62**	**10.04**	**10.58**	**9.15**	**9.85**
	B2	**6.46**	**7.13**	**7.84**	**7.04**	**5.97**	**6.89**	**7.88**	**8.58**	**9.57**	**8.61**	**7.25**	**8.38**
	B3	**5.66**	**5.60**	**5.49**	**5.60**	**7.16**	**5.90**	**6.90**	**6.83**	**6.73**	**6.46**	**8.35**	**7.05**
Mean of C		**6.73**	**6.85**	**7.21**	**7.08**	**6.84**	**6.94**	**8.21**	**8.34**	**8.78**	**8.55**	**8.25**	**8.43**
L.S.D. at 5%		**A:** 0.487** **B:** 0.620** **C:** NS			**AB:** 0.741* **AC:** NS **BC:** 1.315* **ABC:** NS			**A:** 1.118* **B:** 0.871** **C:** NS			**AB:** 1.135* **AC:** NS **BC:** 1.661* **ABC:** NS		

Where: **b1**: 140.000 plant/fed., **b2**: 186.666 plant/fed. and **b3**: 210.000 plant/fed.

C1: Select super (250 ml) + Basagran (750 ml) (35 DAS), **C2**: Select super (250 ml) (35 DAS) + Basagran (750 ml) (50 DAS), **C3**: Select super (500 ml) + Basagran (750 ml) (35 DAS), **C4**: Select super (500 ml) (35 DAS) + Basagran (750 ml) (50 DAS) and C5: hand hoeing twice (35 and 50 DAS).

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الملخص العربي

تأثر صفات نمو فول الصويا بمعاملات نُظم الخدمة والكثافة النباتية ومكافحة الحشائش.

إيمان محمد طه – عبدالحميد السيد القراميطي – منصور عبدالمجيد سالم - أسماء أبوبكر محمد عبدالقادر
قسم المحاصيل – كلية الزراعة – جامعة المنيا – مصر.

لدراسة تأثير معاملات نُظم الخدمة ، والكثافة النباتية ، ومكافحة الحشائش والتفاعل فيما بينها على خصائص الحشائش ، وصفات النمو لمحصول فول الصويا (Glycine max, L., Merrill) صنف. جيزة 111 ، أجريت تجربتان حقليتان بالمزرعة البحثية بكلية الزراعة – جامعة المنيا، خلال الموسمين المتتاليين لعامي 2019 و 2020. وكان القمح المنزرع على خطوط هو المحصول السابق في الموسمين.

أثبتت النتائج أن الخدمة الكاملة عززت معظم صفات نمو فول الصويا المختبرة (عدد الأفرع لكل نبات ، مساحة الورقة ، دليل مساحة الورقة) وقللت صفات الوزن الجاف للحشائش الضيقة والعريضة والكلية مقارنة بعدم الخدمة في كلا الموسمين. وأدت زراعة النباتات بمعدل 140000 نبات / فدان إلي الحصول علي أعلى القيم لعدد الأفرع لكل نبات ، ومساحة الورقة ، ودليل مساحة الورقة ، بينما سجلت أطول النباتات وأقل وزن جاف للحشائش بزراعة 210000 نبات/فدان في كلا الموسمين. و في معظم الحالات ، أدي العزيق اليدوي مرتين (35 و 50 يوم بعد الزراعة) إلي الحصول علي أطول نباتات ذات أكبر عدد من الفروع ، بينما أنتجت النباتات التي تلقت سيلكت سوبر بمعدل 500 مل / فدان (بعد 35 يوم من الزراعة) + البازجران بمعدل 750 مل / فدان. (50 يوم بعد الزراعة) أكبر مساحة للورقة و دليل مساحة الورقة، ويمكن القول بأنه من أجل الحصول علي أفضل نمو لفول الصويا يجب تبني نظام الخدمة الكاملة مع زراعة النباتات بمعدل 140000 نبات / فدان والعزيق اليدوي للنباتات مرتين.

الكلمات المفتاحية: فول الصويا ، النمو ، الخدمة ، الكثافة النباتية ، مكافحة الحشائش.