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Evaluation of the performance of dinitroaniline herbicide on growth and yield of soybeans *Glycine max* L when different planting dates after spraying

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Abstract

The research was conducted during 2022-2023 at the Rashedia Research Station in order to evaluate performance of the dinitroaniline herbicide when the *Glycine max* L. crop planting dates differed. The research encompassed two factors, the use of dinitroaniline herbicide is discussed at two levels, second: Planting date of the crop after spraying the herbicide is determined at three levels: immediate, a week, and two weeks post-spray. Research was applied using the method of the study utilized global experiments and a randomized complete block design (RCBD) with three replications. The data was collected and analyzed using the SAS program at the end of the season. The Duncan multiple range test was used to distinguish different averages with different alphabet letters in research. The results showed: that treatment dinitroaniline herbicide is being used achieved a decrease significant increase in the dry weight of the weed and percentage of germination, and a significant increase in plant height, number of pods, and weight of 100 seeds. Planting two weeks after spraying the herbicide significantly reduced the weed's dry weight, and a significant increase in both plant height, the number of pods, and the weight of 100 seeds. Interaction between the control treatment and planting two weeks after spraying the herbicide resulted in a significant increase the dry weight of the weed. is measured (g). Interaction between herbicide treatment and planting immediately after spraying resulted in a significant decrease in the percentage of germination. The herbicide treatment and planting interaction led to significant increases in plant height, pod number, and seed weight two weeks post-spray.

Keywords: Soybeans, dinitroaniline herbicide, sowing dates

Introduction

Glycine max L soybeans are considered one of the annual summer field crops (Legumes, oil crops), as their seeds contain mainly oil and protein, and what increases their importance is that they contain most of the amino acids necessary for body growth. The seeds and what they contain have a wide scope in manufacturing, including the extraction of edible oils, fats, and vegetable butter, in addition to using their oil in making mayonnaise and salads. Seed flour is used in some pastries and ingredients for bread, cakes, and biscuits. It is added to meat, in the manufacture of baby food and sweets, and in special nutrition for diabetes due to its low carbohydrate content. Soybean meal grits are used in feeding poultry and livestock as a concentrated protein, and hay is used in animal feed. There are bacterial nodules on its roots to fix atmospheric nitrogen, which leads to increased soil fertility. Pedersen and Lauer's (2003) ^[12] study examines the influence of planting dates on the oil and protein content of two soybean varieties Hardin and Spansoy 250, in the United States of America the planting date significantly impacted the oil and protein content of the Spansoy 250 variety, with the protein percentage increasing from 35.4% to 36.0%. The study revealed that early planting resulted in a 0.15 increase in oil percentage than in late cultivation. Ruqayya *et al.* (2013) concluded that early planting was significantly superior to late planting in the percentage of oil in seeds, and a significant decrease in the percentage of protein occurred. Treflan herbicide this is one of the dinitroaniline herbicides widely used in combating some weeds grow alongside field crops due to their resistance to herbicides added after germination. (Llewellyn and Powles, 2001) ^[10]. Chauhan *et al.* (2006) ^[3] explained that the herbicide Treflan, which has a high vapor pressure (99.1 x 10 mm H at 29.5 C), is widely used to combat weeds in fields of field crops, and to ensure the effectiveness of the herbicide

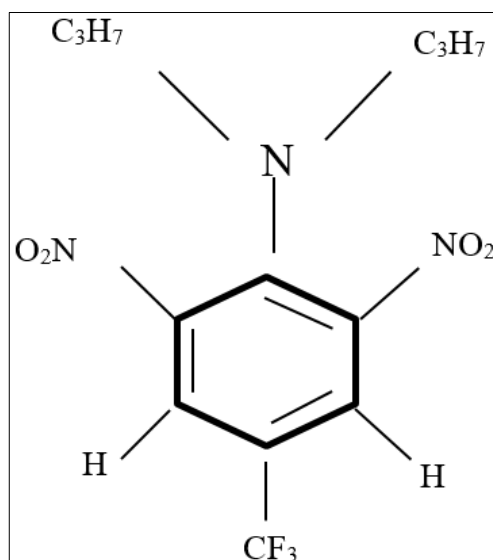
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dinitroaniline, it must be thoroughly mixed in the soil. Both Cudney *et al.*, (1993) [5] and Hayawi (2015) [8] stated that the effect of triflan is through the formation of swollen cells with spherical thickening of the cells in plants treated with the herbicide, and that its effect is rapid on the roots and shoots that it comes into contact with. The aim of the research is to know the best time to plant the soybean crop after spraying the dinitroaniline herbicide, so that it does not affect the germination rate or slow growth of the crop, since the dinitroaniline herbicide is one of the herbicides that is added to the soil.

Materials and methods

The study was conducted at Rashedia Research Station - Mosul during the 2023/2024 agricultural season. The study involved 2 factors.: First: dinitroaniline herbicide at two levels (comparison, recommended concentration), Second: Sowing dates after spraying the dinitroaniline herbicide at three levels: (The planting process involves spraying the herbicide directly after it has been applied., planting 1 week after spraying the herbicide, planting 2 weeks after spraying

the herbicide. Research was carried out using a factorial experiment system and a completely randomized block design (RCBD). The process of spraying the dinitroaniline herbicide was carried out at the recommended concentration (1248 cm³.ha⁻¹) in the early morning using a backpack sprayer with a capacity of (16) liters. The planting process continued from (4/15/2023 to 4/29/2023) with the seed rate of (36) kg. ha⁻¹ for the Shaima variety, with the planting lines should be spaced at a distance of 50 cm. in the experimental unit, was (2.5 m x 5 m), and with a distance of one meter between replicates. One month after each planting date, samples of the weed were taken randomly, at rate of one square meter from each experimental unit, to study dry weight of the weed. At end of season, the plants were harvested and the characteristics studied included the percentage of germination (%), plant height (cm). The formula calculates the number of seeds in a pod, the weight of 100 grains, and the number of pods in plant⁻¹. The data was analyzed using the SAS software program, the Duncan multiple range test is used to compare means at a probability level of 0.05.



Chemical composition of dinitroaniline herbicide α, α, α - Trifluoro - 2, 6 - dinitro-N,N -dipropyl-p-toluidine

Results and Discussion

Dry weight of weed (g⁻²)

The statistical analysis results are presented in Table (1) the study indicates that dinitroaniline herbicide treatment significantly reduced the dry weight of the weed compared to the control treatment. This could be attributed to the ability of dinitroaniline herbicide to limit growth of weed plants, in addition to the fact that the plants escaping from the action of the herbicide are poor growth, which is reflected in a decrease in the dry weight of weed. The study found that planting two weeks after herbicide spraying led

to a significant decrease in weed dry weight, with three different weeds having a dry weight of 66.9, 65.6, and 60.8 g⁻² respectively. The reason for this could be attributed to the effectiveness of the herbicide dinitroaniline. In reducing growth of weed plants before the crop seeds begin to germinate (Neelu, 2015) [11]. The study indicates that the interaction between dinitroaniline herbicide and agriculture is significant for two weeks. after spraying the herbicide achieved the lowest dry weight of the weed accompanying the soybean crop, as it reached (38.33) gm⁻², while The study investigates the interaction between the control treatment and agriculture after two weeks resulted in a higher recording. Dry weight, which reached (83.33) g⁻².

Table 1: Effect of dinitroaniline herbicide, planting date, and their interaction on the dry weight of seedlings (g)

Treats	Planting dates after spraying dinitroaniline hrebicide			
	Directly	After 1 week	After 2 week	Effect of Herbicide
Control	66.6 c	74.0 b	83.3 a	74.6 a
Trflan	67.3 c	57.3 d	38.3 e	54.3 b
Effect of planting date	66.9 a	65.6 ab	60.8 b	

Similar letters mean there are no significant differences at the 0.05% level

Germination (%)

Table (2) presents the results indicate the dinitroaniline herbicide treatment caused The germination percentage decreased significantly compared to the control treatment, reaching 95.2% and 64.7% for the two treatments, respectively. The reason for this may be due to the seeds entering contact with the herbicide, which increased how these plants are affected is reflected in the germination rate (Hayawi, 2022) [9], and this result is consistent with what he reached (Hayawi, 2015) [8]. The germination percentage was significantly higher when planting a week after spraying the herbicide than the other two dates, as the germination

percentage reached (68.6, 88.6, and 76.6%) for the three treatments, respectively, and this result was similar to what was obtained (Hamad and Hayawi, 2019) [6]. The interaction between the control treatment and planting immediately after spraying the herbicide, as well as the control treatment and planting a week after spraying the herbicide, achieved the highest germination rate, the germination rate reached a significantly higher level than the other interactions. (94.9 And 92.7%) for the two interventions, respectively, while the lowest percentage was (42.4) % when there is an interaction between treatment with Trflan herbicide and agriculture immediately after spraying the herbicide.

Table 2: Effect of dinitroaniline herbicide, planting date, and their interaction on germination percentage (%)

Treats	Planting dates after spraying dinitroaniline hrebicide			
	Directly	After 1 week	After 2 week	Effect of Herbicide
Control	94.9 a	92.7 a	89.0 b	95.2 a
Trflan	42.4 e	84.6 c	64.2 d	63.7 b
Effect of planting date	68.6 c	88.6 a	76.6 b	

Similar letters mean there are no significant differences at the 0.05% level

Plant height (cm)

Table (3) The study found that the dinitroaniline herbicide the treatment significantly improved plant height compared to the control treatment, possibly due to the absence of competition between the crop and the weed, which reflected positively on this trait (Amaregouda *et al.*, 2013) [1]. The agricultural treatment two weeks after spraying the herbicide achieved the highest average plant height, reaching (83.1 cm). Perhaps the reason for this may be

attributed to washing the pesticide into the soil and its presence far from the depth of the seed presence in the soil. The result obtained by Hayawi *et al.* (2021) [7] was identical to the one obtained. The dinitroaniline herbicide, the herbicide treatment resulted in the highest plant height of 104 cm after two weeks of cultivation, while the control treatment resulted in the lowest height and cultivation were combined two weeks after spraying the herbicide, as the height reached (62.33 cm).

Table 3: Effect of dinitroaniline herbicide, planting date, and their interaction on plant height (cm)

Treats	Planting dates after spraying dinitroaniline hrebicide			
	Directly	After 1 week	After 2 week	Effect of Herbicide
Control	70.0 c	68.0 d	62.3 e	66.7 b
Trflan	73.6 c	79.6 b	104.0 a	85.7 a
Effect of planting date	71.8 b	73.8 b	83.1 a	

Similar letters mean there are no significant differences at the 0.05 % level

Number of pods plant⁻¹

Table (4) reveals that the dinitroaniline herbicide treatment significantly outperformed the control treatment in terms of the average number of pods plant⁻¹ by an increase of (23.1%). This may be due to effectiveness of dinitroaniline herbicide in limiting growth of weed plants and reducing competition between the crop and the accompanying weed, which this was reflected positively on the growth characteristics and yield of crop plants (Reis and Vivian, 2020) [2]. The data show a gradual there has been a significant increase in the average the total number of plants pods with different planting dates after spraying the herbicide, as the number of plant pods reached (209.8, 220.1, 269.6) the three dates are listed in the given text.

Delaying planting two weeks after spraying the herbicide may be the reason for this caused killing or inhibiting the growth of the weed plants, which made the crop plants face competition from weed for essentials of life, so the number of plant pods increased accordingly (Chikezie *et al.*, 2019) [4]. The study found that the interaction between dinitroaniline herbicide and planting time, two weeks after spraying the herbicide, significantly influences the results achieved the highest number of plant pods, reaching (348.6) pods plant⁻¹ was thus significantly superior to all interactions, while lowest number of plant pods was (190.6) pods plant⁻¹, when the control treatment was combined with cultivation after two weeks, achieved the lowest number of pods per plant, which reached (190.6) pod plant⁻¹.

Table 4: Effect of dinitroaniline herbicide, planting date, and their interaction on the number of pods plant⁻¹

Treats	Planting dates after spraying dinitroaniline hrebicide			
	Directly	After 1 week	After 2 week	Effect of Herbicide
Control	217.3 c	200.3 c	190.6 d	202.7 b
Trflan	202.3 c	240.0 b	348.6 a	263.6 a
Effect of planting date	209.8 c	220.1 b	269.6 a	

Similar letters mean there are no significant differences at the 0.05% level

Weight of 100 Seeds (g)

The results of Table (5) indicate that the dinitroaniline herbicide treatment caused the average weight of 100 grains

showed a significant increase compared to the comparison treatment. as the weight reached (14.5 and 14.9) grams for two treatments, respectively. The reason for this may be due

to efficacy of dinitroaniline herbicide in reducing from growth of weed plants provided a new opportunity for crop plants to grow well and thus this increase in the components of the crop (Hayawi, 2022) ^[9]. Two weeks after spraying herbicide, agriculture achieved a significant increase in average weight of 100 seeds, as weight of 100 seeds for the three treatments reached (14.5, 13.1, 16.6) grams, respectively. Reason for this may be attributed to the association of this trait with many growth and yield

characteristics, in addition to the significant decrease in dry weight of the weed. Data indicates the interaction between treatments with dinitroaniline herbicide is significant and cultivation two weeks after spraying the herbicide caused a significant increase in the average weight of 100 seeds. As for lowest weight of 100 seeds, it was achieved when the interaction between the dinitroaniline herbicide and agriculture occurred a week after spraying the herbicide, as it reached weight of 100 seeds (11.6 g).

Table 5: Effect of dinitroaniline herbicide, planting date, and their interaction on the weight of 100 seeds (g)

Treats	Planting dates after spraying dinitroaniline hrebicide			
	Directly	After 1 week	After 2 week	Effect of herbicide
Control	217.3 c	200.3 c	15.6 b	14.5 b
Triflan	202.3 c	240.0 b	17.9 a	14.9 a
Effect of planting date	209.8 c	220.1 b	16.6 a	

Similar letters mean there are no significant differences at the 0.05% level

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