Effect of Spraying date of boron on Vegetative Growth and Yield of Cotton Plant (Gossypium hirsutum L.) Lashata Variety

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Abstract

A field experiment was conducted during the spring season of the year 2018 in the fields of the Cotton Research Unit at the Technical Agricultural College / Mosul to study the effect of spraying the element boron for different dates (the stage of vegetative growth, the stage of opening blooming buds, the stage of boll formation) and the interferences between these dates on the characteristics of vegetative growth and cotton components Lashata cultivar, and used the design of complete randomized block in the implementation of the experiment. The results of the study showed that the date of spraying with boron in the two stages of vegetative growth and flowering buds open significantly exceeds the rest of the dates in the characteristics of plant height (cm) and the number of nodes up to the first fruit branch and the number of vegetable branches and the number of fruit branches in values (135.8 cm, 6.1, 4.5, 16.8) respectively, the duration of spraying with boron in the vegetative stage exceeded the rest of the dates by its effect on the characteristics of the total number of bolls and the weight of one boll (gm), the seed index and the yield of the cast cotton values (36.8, 6.82 g, 4.050, 995.2 kg -1), respectively. the date of spraying is also superior in the vegetative stage of growth significantly on the rest of the dates on the characteristics of its effects type (E and percentage of hair and the percentage of the early) values (42.8, 40.5% staple guide, and 82.15%) respectively.

1. Introduction

Cotton is considered an important economic crop, as it is used in the textile industry in the textile and paper and medical cotton industries in addition to extracting oil from its seeds. As for the resulting grain from seeds, it is used in animal feeding, and cotton production can be increased and its quality improved through attention to agricultural operations, especially fertilization, including Minor elements, because most of the elements present in Iraqi soil are not ready for absorption due to the high content of calcium carbonate, which leads to stabilization and sedimentation when added to the soil, which reflects negatively on the quantity, quantity and quality (1). The addition of boron spray on the vegetative system and with a specific date has an important role in the transfer of sugars, the activation of many enzymes, the production of pollen grains, the formation of carbohydrates and proteins, and the production of phenols and contributes to regulating the osmotic effort by increasing the plant's ability to absorb potassium and positive ions (2). It also indicated (3) that the boron has an effect on the growth of the developing summit of the plant, the rapid growth of the Mistramian tissues, the increase in the length of the internods of the stem, and the activation of the cell membranes. It was also found (4) and (5) that the boron causes an increase in the height of the plant, as it was found (6) that Add boron lead to an increase in cotton holds hair, have noted (7) that spray micro elements such as boron at the beginning of flowering led to an increase in the number of fruiting branches. It was also found (8) that when spraying with boron at different concentrations (0, 10, 20, 30, 40 mg liters -1) on three varieties of cotton (Ashor, Coker 310, lashata) three times in the stages of (vegetative growth, open Flowering buds, and two weeks after flowering buds open), the lashata cultivar out performed Assyria in traits (plant height, number of vegetative and fruiting branches, number of open bolls, weight of one boll, seed guide, hair weight, weight of flower cotton) where the values reached (107.1 cm), 4.64, 18.46, 14.9, 4.54 g, 8.08, 5.78, 622.1 kg, Donum -1, 4.53 tons. E -1 (respectively) and the response was clear for all items at a high concentration of boron (40) Mg liter -1) and for all studied traits. In view of the lack of research on the cotton issue in Iraq, the research was conducted to find out the effect of the date of the spraying addition of the boron component, brises on the growth and yield of cotton under the conditions of the Rashidiya area in the city of Mosul, Nineveh Governorate.
2. Materials and Methods of Work

The research was carried out at the Agricultural Technical College / Mosul in the fields affiliated to the Cotton Research Unit during the spring season of 2018, to study the effect of spraying boron in commercial form (Boracrol) and containing boron by (W/W 10%), using a concentration of (1.7 ml) Of boracrol / liter of water, equivalent to 2.5 mg. Liter⁻¹ of boron, which is the recommended amount added of boron, as indicated by (2) and the effect of this on the plant variety / Lashata origin (Spanish). The operations of tillage, leveling and division were carried out with a length of (3m) and the distance between the square (90cm), so that the experimental unit included two beds, the seed of the cotton (Lashata) was planted on 10/4/2018 and the distance between hole and another (40 cm) was on one side of the center. Sample soil were taken to study chemical and physical properties before planting (Table 1). Phosphate fertilizer was added as a triple superphosphate at a rate of (60 kg. H⁻¹) when preparing the land for cultivation. As for nitrogen fertilizer (urea), it was added at a rate of (200 kg. E⁻¹) in two periods, the first after a month of germination and the second when the buds began to form. The vase, after that, the boron spray was carried out on the vegetative system until complete wetness and using adhesive spreader (Tween 20) and on three dates, in the vegetative growth stage on (1/6) and in the flowering stage on (20/7) and in the formation phase of the bolls on (20/8). The experiment included eight treatments and three replications: the treatment of control and spraying in the above-mentioned stages and their interactions with each other. At the end of the season, the following characteristics were studied on ten intermediate plants from each experimental unit: Plant height, No. of nods, No. of vegetative branches, no. of fruiting branches, Total number of bolls, weight of boll(gm), weight of 100 seeds (gram)(seed index, total cotton yield (kg/he) .

Table 1. some chemical and physical characteristics of the soil

| Type of analysis                                      | The unit of measurement |
|--------------------------------------------------------|-------------------------|
| Electrical Conductivity (1: 1)                         | 0.51 DC Siemens -1      |
| The positive exchange capacity                         | 18.3 cents. Kg⁻¹        |
| Organic matter                                         | 165 g. Kg⁻¹             |
| Calcium carbonate                                      | 249 g. Kg⁻¹             |
| Ready nitrogen                                         | 23                      |
| Ready phosphorous                                      | 12 mg. Kg⁻¹             |
| Ready Potassium                                        | 179                     |
| Sand                                                   | 219 g. Kg⁻¹             |
| Clay                                                   | 231 g. Kg⁻¹             |
| Silt                                                   | 450 g. Kg⁻¹             |
| PH PH (1: 1                                            |                         |

3. Results and Discussion

The results in Table (2) showed the effect of the date of spraying boron in the characteristic of plant height (cm). There was a significant difference in the date of addition in the stage of vegetative growth and flowering over the rest of the dates followed by the date of addition in the stage of vegetative growth, then the flowering stage, then the stage of growth and flowering, and the formation of bolls, then the date of vegetative growth The composition of the boll after that is the date of flowering and the composition of the boll, then the date of forming the boll and the comparison treatment with the following values (135.8, 128.2, 120.5, 113.4, 110.1, 105.6, 102.2, 92.5 Cm), respectively. There were no significant differences in its effect on the plant height between the two treatments (vegetative growth + boll formation), treatment (flowering stage + boll formation), and treatment (vegetative growth + boll formation) and treatment (vegetative growth + flowering stage + boll formation). (As for the adjective number of the contract to an up stream branch, too, the date of vegetative growth and flowering outweighed the rest of the transactions significantly (6.1), followed by the date of vegetative growth and flowering. There were significant differences between the transactions except for the vegetative growth and boll formation, flowering and boll formation and between the two growth factors Vegetative and boll formation, treatment of growth and flowering, and boll formation as well between flowering and vegetative growth treatments.

As for the characteristics of the number of vegetative branches, the treatment of vegetative growth and flowering was also significantly superior to the rest of the transactions with a value of (4.5) and did not differ significantly with the treatments of vegetative growth and flowering, whereas the lowest value of the comparison treatment was (3.5).
As for the characteristics of the number of fruit branches, the differences were morally clear between all transactions, where the best transactions were (treatment of vegetative growth and flowering) with a value of (16.8) followed by the treatment of vegetative growth (15.5), then a treatment and then treatment (growth, flowering and bolls) of (14.4) The lowest transactions are the comparison treatment and the composition of bolls (7.5, 8.1). From the above results, it is clear that the role of the boron element by transferring sugars, activating enzymes, forming carbohydrates, proteins and phenols is clear, and the osmotic effort is organized, which causes the growth of developing peaks and Mistramian tissues, increasing the length of internodes, activation of cell membranes, and the transfer of substances between parts of the plant, and this is consistent with what he mentioned (4, 5 and 7).

Table 2. Effect of boron spraying at different growth periods on the characteristic of vegetative group of cotton plants (Gossypium hirsutum L.) Lashata variety*

| Yield components | Growth periods                          | Plant height(cm) | No. of nodes | No. of vegetative branches | No. of fruiting branches |
|------------------|----------------------------------------|------------------|--------------|----------------------------|-------------------------|
| Comparison treatment | Vegetative growth stage                | 92.5 h           | 3.6 f        | 3.5 e                      | 7.5 g                   |
|                   |                                        | 128.2 b          | 5.5 b        | 4.3 ab                     | 15.5 b                  |
| Flowering stage   |                                        | 120.5 c          | 5.1 bc       | 4.1 ab                     | 10.8 e                  |
| boll formation period |                                   | 102.2 g          | 4.0 ef       | 3.6 de                     | 8.1 f                   |
| Vegetative growth stage + flowering stage |                          | 135.8 a          | 6.1 a        | 4.5 a                      | 16.8 a                  |
| Vegetative growth stage + boll formation period |                                  | 110.1 ef         | 4.5 de       | 3.6 b--e                   | 13.3 c                  |
| Flowering stage + boll formation period |                                    | 105.6 c          | 4.2 ef       | 3.8 c--e                   | 12.2 d                  |
| Vegetative Growth + flowering stage + boll formation period |                                 | 113.4 de         | 4.8 cd       | 4.0 b--d                   | 14.4 c                  |

* Numbers that share the same alphabet, there are no significant differences between them, according to the Duncan multiple test, under 5% probability level.

The results also showed Table No. (3) the effect of the date of spraying with boron on the attributes of the quotient, which is the characteristic of the total number of walnuts, where the stage of vegetative growth significantly (36.8) was significantly superior to the rest of the transactions, followed by the flowering stage, then the vegetative growth and flowering stage, and the lowest value for the comparison treatment (10.7) and the period Composition of the nut (12.8). No significant differences emerged between the treatment of comparison and the composition of the nut, nor between the treatments of flowering and (vegetative growth + flowering stage). As for the forgetfulness of the weight of a single boll weight (gm), the vegetative growth period was significantly superior to (6.82 gm) over the rest of the transactions, followed by the flowering stage, and the lowest value was the comparative treatment and the boll formation stage, and no significant differences emerged between the comparison and composition of the boll and between the vegetative and flowering treatments and the composition of nut for the weight of 100 seeds (seed index). The vegetative growth treatment outperformed the rest of the transactions significantly, with a value of (4.050). The lowest value for the comparison treatment was (2.605). The differences between the rest of the transactions were moral, non-significant, and close...with regard to the trait of the yield cotton (kg. E⁻¹), significant differences emerged between the transactions, as the stage of vegetative growth outperformed by (995.2 kg. E⁻¹), followed by the flowering treatment and the lowest value was the comparison treatment.

The results show the prominent role of boron spraying in the stage of vegetative growth and flowering, i.e. between the beginning of vegetative growth and fruiting growth as an important stage for adding boron and its prominent effect on cell
division and transfer of the necessary materials for this from the leaves to the sites of vegetative growth and flowering as well as its role in the formation of materials needed for plant growth and this is consistent with what was mentioned by (6, 7). These results may be perhaps because also to the information which explained in table (1) about physical and chemical properties of soil in that place of experiment which proved the growth cotton plants especially in vegetative growth stage and flowering buds stage and by increasing the plant hormones in apical buds of vegetative and fruiting branches.

Table 3. Effect of boron spraying at different growth periods on the yield of Cotton plant (Gossypium hirsutum L.) and its components

|                     | Yield components | Total number of bolls | weight of boll(gm) | weight 100 seeds (Seed index) | Cotton yield Kg / ha |
|---------------------|------------------|----------------------|-------------------|-------------------------------|---------------------|
|                     | Growth periods   |                      |                   |                               |                     |
| Comparison treatment|                  |                      |                   |                               |                     |
| Vegetative growth stage |              | 10.7 f               | 4.06 g            | 2.605 f                       | 311.7 h             |
| Flowering stage     |                  | 36.8 a               | 6.82 a            | 4.050 a                       | 995.2 a             |
| boll formation period |                | 33.1 ab              | 6.25 b            | 3.825 ab                      | 886.4 b             |
| Vegetative growth stage + flowering stage | | 12.8 ef | 4.52 fg | 2.825 fg | 521.6 g |
| Vegetative growth stage + boll formation period | | 30.4 bc | 5.62 c | 3.645 bc | 810.6 c |
| Flowering stage + boll formation period | | 21.2 d | 5.18 de | 3.428 de | 684.6 e |
| Vegetative Growth stage + flowering stage + boll formation period | | 16.5 e | 4.82 ef | 3.400 de | 601.5 f |
|                     |                  | 27.6 c               | 5.45 de           | 3.150 cd                      | 775.5 d             |

Numbers that share the same alphabet, there are no significant differences between them * according to the Duncan multiple test, under 5% probability level

It can be concluded from the above results that adding boron spraying to Lashata cultivar plants with a concentration of 2.5 mg / l \(^{-1}\) resulted in a significant increase in the characteristics of vegetative growth and flowering period more than the rest of the other stages, and this effect was reflected in subsequent periods of plant growth, which is an increase in The quantity of the total yield of cotton plant, and accordingly it is recommended to conduct other research using different concentrations of boron and agricultural areas other than Nineveh Governorate to increase the yield to meet the desire of the producer and the consumer.

References

[1] Abu Dahi, Youssef Muhammad and Umayyad Ahmad Al-Younis. 1988: Manual of Plant Nutrition, Ministry of Higher Education and Scientific Research, University of Baghdad, Dar Al-Kutub Printing Press.
[2] Hammadi Talaat Hassan. 1991: Microelements in Agriculture, Dar Al-Hekma Foundation for Printing and Publishing, University of Baghdad. Iraq.
[3] Gupata, U.C. 1979 Boron nutrition of crops' Advances in agronomy. 31: 273 - 307.3
[4] Mengel, K., and E.A. Kirkby. 1982. Principles of plant nutrition. International potash Institute, Bern, Switzerland.
[5] Abdel, M., N. Ahmed, A. Ali, M.A. Chaudhry and J. Hussain. 2007 Leaf boron content of cotton (Gossypium hirsutum L.). University college of Agric. Bahaudin Zekaria univ. multan Pakistan journal of Agric. and soil sci. 1-4.
[6] Gormus, O. 2005. Interactive effect of nitrogen and boron on cotton yield and fiber quality. Turkish J. of Agric. (29) P: 51—59.
[7] Wassel, O.M.M., M. Mt. Ghourab and Ganalat A. Wahclan. 2000. Response of cotton plant to nitrogen fertilizer and micronutrients. Munifiya jour. Agric. Res. 25 (6). PP: 1413 – 1424.
[8] Mohammad Ali Al-Assaf, Fadel Rashid Othman, Raad Lahoub Aboud: The effect of boron spray on the growth and yield of three varieties of cotton 2011, Al-Anbar Journal of Agricultural Sciences, 9 (1)

[9] Dawood, Khaled Muhammad, Zaki Abd Elias 1995 Statistical Methods for Agricultural Research, Directorate of Dar Al Katub for Printing and Publishing, University of Mosul, Iraq.