

Original Research Article

“Impact of sulphur levels and boron on growth and yield of summer green gram (*Vigna radiata* L.)”

ABSTRACT

A field experiment was conducted during *Zaid* 2022 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P). To determine the “Impact of sulphur levels and boron on growth and yield of summer green gram (*Vigna radiata* L.)”. The results showed that treatment 9 [Sulphur (15 kg/ha) + Boron (0.6%)] recorded significantly higher plant height (47.5cm), higher number of branches/plant (8.80), higher plant dry weight (7.38g), higher number of nodules/plant (7.40). Significant and maximum number of pods/plant (29.4), maximum number of seeds/pod (10.33), higher test weight(29.80 g), higher seed yield (1.21 t/ha), higher haulm yield (2.81 t/ha), higher harvest index (30.3 %), was recorded in treatment 9 [sulphur (15 kg/ha) + Boron (0.6%)]. Maximum gross returns (82022.00 INR/ha), net returns (53523.70 INR/ha) and B:C ratio (1.87) was also recorded in treatment 9 [sulphur (15 kg/ha) + Boron (0.2%)] as compared to other treatments.

Keywords: Sulphur, boron, growth, yield and economics

Introduction

Mung bean (*Vigna radiata* L.) commonly known as greengram is an important conventional pulse crop of India. It is originated from India and central Asia. It is also called as “Golden Bean” because of its nutritive values and suitability for increasing the soil, by the way of addition of nitrogen to the soil. It is considered as poor men’s meat containing almost triple amount of protein as compared to rice. It has high nutritive value, and due to this, has advantage over the other pulses. Mung bean is a short day, warm season crop, grown mainly in semi arid to sub humid tropics and tropics with 600 to 1000 mm annual rainfall, for a high yield, a warm climate and deep well drained loam or sandy loam soils are desired. The seed contains protein (24.20%), fat (1.30%), and carbohydrates(60.4%), calcium is 118 and phosphorus is 340 mg/100gram of seed, respectively (**Imran et al., 2016**). Greengram improves physical properties of soil and fixes atmospheric nitrogen (**Sengupta et al., 2015**). Greengram contains about 24.3 % protein and is good source of riboflavin and thiamine (**Janaki et al., 2020**).

Greengram is one of the important pulse crops, which ranks third in area and production after pigeon pea and chickpea and is grown in almost all parts of the country over a wide range of agro-climatic condition. In India, Green gram is grown over an area about 51.30 lakh ha with an average production of 3.85 lakh tonnes and productivity of 601 kg/ha under 2020-2021. Total coverage under green gram in Uttar Pradesh 0.86 Lakh/ha with a production 0.61 Lakh tonnes and the productivity 709 kg/ha (**GOI, 2020**). According to government fourth advance estimates, greengram production in 2021-22 is at 3.15 million tonnes.

Sulphur plays an important role in growth and development of crops. It plays important role in the formation of S-containing amino acids like cysteine (27% S), methionine (26% S), which act as building blocks in the synthesis of proteins (**Kokani et al., 2014**). It has role to play in increasing chlorophyll formation and aiding photosynthesis and also plays a role in the activation of enzymes, nucleic acids and forms a part of biotin and thiamine. Sulphur is considered as critical for seed yield and protein synthesis and for improvement in quality of produce in legumes through their enzymatic and metabolic effects (**Bhattacharjee et al., 2013**).

Boron is a trace element that can be applied in soil as well as foliar. It is many times observed that foliar applied boron causes increased yield more than soil applied boron because boron

is required more at reproductive stage and foliar applied is instantly present for plant in compare to soil applied boron. Boron is very important in plant metabolism through acting activity of certain enzyme, cell division, carbohydrate transport, and calcium and potassium uptake and protein synthesis; ultimately it may enhance in pod and seed formation. Boron ranks third place among micronutrients in its concentration in seed and stem as well as its total amount after zinc. Boron is an essential micronutrient for plant, but the range between deficient and toxic B concentration is smaller than for any other nutrient element. Plant responds directly to the activity of B soil solution and only indirectly to B adsorbed on the soil constituents. Soil factors affecting availability of B to plants are viz; pH, texture, moisture, temperature, organic matter and clay mineralogy (Movalia *et al.*, 2020).

Sulphur is essential in forming plant proteins because it is a constituent of certain amino acids. It is actively involved in metabolism of the B vitamins biotin and thiamine and co-enzyme A. Its mostly aids in seed production, chlorophyll formation, nodule formation in legumes, and stabilizing protein structure. The process of tissue differentiation from somatic to reproductive meristematic activity and development of floral primordial have increased and also more flowers and pods longer and increases the yield .So there is a scope of increasing the mungbean unit area by using balanced sulphur.

Boron deficiency seen in upper internodes of the stem are shortened, giving the plants a rosette appearance. Upper leaves near the growing points turn yellow and sometimes red. Symptoms are most severe at the leaf tips while the leaf base remain green. Pollen grains, poor pollen vitality and reduced number of flowers/plant besides stunted root growth.

Boron is necessary in the synthesis of one of the bases for RNA formation and in cellular activities and promote root growth. It is essential for pollen germination and growth of the pollen tube and also formation of flowers, and for development of seed. Boron has been associated with lignin synthesis, activities of certain enzymes, seed and cell wall formation, and sugar transport. Its helps in absorption and utilization of calcium in plants. Keeping in view the above facts, the present investigation was undertaken to find out “ Impact of sulphur levels and boron on growth and yield of summer greengram (*Vigna radiata* L.)”

MATERIALS AND METHODS:

The experiment was conducted during the *Zaid* season 2022 at the Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P.). The soil of the field constituting a part of central gangetic alluvium is neutral and deep. The soil of the experimental field was sandy loamy in texture, nearly neutral in soil reaction (pH 7.8), low level of organic carbon (0.28%), available N (225 kg/ha), P (19.50 kg/ha), K (92.00 kg/ha). The treatment consists of three different levels of sulphur *viz*, 5kg/ha, 10kg/ha, 15kg/ha with combination of different levels of boron *viz*, 0.2%, 0.4%, 0.6%. The experiment was laid out in RBD with 10 treatments each replicated thrice. The treatment combinations are T1 – Sulphur (5kg/ha) + Boron (0.2%), T2 – Sulphur (5kg/ha) + Boron (0.4%) , T3 – Sulphur (5kg/ha) + Boron (0.6%), T4 – Sulphur (10kg/ha) + Boron (0.2%), T5 – Sulphur (10kg/ha) + Boron (0.4%), T6 – Sulphur (10kg/ha) + Boron (0.6%), T7 – Sulphur (15kg/ha) + Boron (0.2%), T8 – Sulphur (15kg/ha) + Boron (0.4%), T9 – Sulphur (15kg/ha) + Boron (0.6%), T10 – (Control) N:P:K 20:40:20kg/ha.

All agronomic practices are followed in order in the crop period. Experimental data collected was subjected to statistical analysis of variance (ANOVA) as outlined by Gomez and Gomez (1984). Critical Difference (CD) values were calculated wherever the 'F' test was found significant at 5 percent level.

RESULT AND DISCUSSION

Growth parameters

Plant height (cm)

The data revealed that significant and higher plant height(47.5cm) was observed in treatment 9 [Sulphur (15 kg/ha) + Boron (0.6%)]. However, treatment 8 [Sulphur (15 kg/ha) + Boron (0.4%)] were statistically at par with the treatment 9 [Sulphur (15 kg/ha) + Boron (0.6%)] [Table 1]. The significant and higher plant height was with application of Sulphur (15kg/ha) might be due to involvement of sulphur in stimulation of cell division, photosynthetic process as well as formation of chlorophyll **Arunraj *et al.*,(2018)**. Further, the application of boron(0.6%) this might be due to enhances the differentiation of tissue cell division and nitrogen absorption from the soil. Similar result was found by **Singh *et al.*, (2014)**.

Number of branches/plant

The data revealed that treatment 9 [Sulphur (15 kg/ha) + Boron 0.6%]] recorded significant and maximum number of branches/plant (8.80) which was superior to all the treatments and the treatment 8 [Sulphur (15 kg/ha) + Boron 0.4%]], treatment 6 [Sulphur (10 kg/ha) + Boron (0.6%)]and treatment 5 [Sulphur (10 kg/ha) + Boron 0.4%]] were statistically at par with the treatment 9[Sulphur (15 kg/ha) + Boron 0.6%]]. The significant and maximum number of branches/plant was with the application of sulphur (15kg/ha) might be due to regulating metabolic and enzymatic process in plants **Rao et al., (2001)**. Further, maximum number of branches/plant might be due to the application of boron (0.6%) promoting root and shoot growth, flower fertility and essential nutrient for nodule forming bacteria therefore, increased nodule count resulting in increasing in effect of number of branches/ plant. Similar findings also reported by **Movalia et al., (2020)**.

Plant dry weight

Data found that significant and higher plant dry weight (7.38g) was obtained in the treatment 9 [Sulphur (15 kg/ha) + Boron 0.6%]]. However, no treatment was statistically at par with the treatment 9. The significant and higher plant dry weight was with the application of sulphur (15kg/ha) might be due to the continuous and slow release of nutrients **Arunraj et al., (2018)**. Further, maximum plant dry weight was observed by application of boron (0.6%) might due to the stabilizing certain constituents of cell wall and plasma membrane, enhancement of cell division, tissue differentiation and metabolism of nucleic acids, carbohydrates, proteins, auxins and phenols. Similar results were reported by **Padbhushan et al., (2014)**.

Number of nodules/plant

Results revealed that treatment 9 [Sulphur (15 kg/ha) + Boron 0.6%]] recorded significantly maximum number of nodules/plant (7.40). However, treatment 8 [Sulphur (15 kg/ha) + Boron 0.4%]] were statistically at par with the treatment 9 [Sulphur (15 kg/ha) + Boron 0.6%]]. The significant and maximum number of nodules/plant was with application of sulphur (15kg/ha) might be due to the increasing leg haemoglobin pigment formation in nodules **Parry et al., (2017)**. Further, maximum number of nodules/plant might be due to the application of boron (0.6%) root and shoot growth, flower fertility and essential nutrient for nodule forming bacteria. Similar results were

reported by **Movalia et al., (2020)**.

Crop Growth Rate (g/m²/day)

The data revealed that during 45-60 DAS no significant difference among all the treatments. However, highest Crop Growth Rate (1.1g/m²/day) was observed in treatment treatment 9 [Sulphur (15 kg/ha) + Boron 0.6%].

Relative Growth Rate (g/g/day)

The data revealed that during 45-60 DAS, treatment 9 [Sulphur(15kg/ha) + Boron 0.6%]) recorded significantly higher Relative Growth Rate (0.0409g/m²/day), though there was no significant difference among the treatments.

Yield attributes:

Number of pods/plant

The data showed that (29.4) treatment 9 [Sulphur (15 kg/ha) + Boron 0.6%]) recorded significantly higher number of pods/plant (29.4). However, treatment 8 [Sulphur (15 kg/ha) + Boron 0.4%]) were statistically at par with the treatment 9 [Sulphur (15 kg/ha) + Boron 0.6%]) [Table 2]. The significant and higher number of pods/plant was with the application of sulphur (15kg/ha) might be due to the tissue differentiation from somatic to reproductive meristematic activity and development of floral primordial might have increased with increasing in more flowers and pods **Mazed et al.,(2015)**. Further, maximum number of pods/plant was observed with the application of boron(0.6%) might be due to the formation of flower and pollen grain thus increases the pods/plant. Similar findings also reported by **Padbhushan et al., (2014)**.

Number of seeds/pod

The data recorded that significant and higher number seeds/pod(10.33) was recorded in treatment 9 [Sulphur (15 kg/ha) + Boron 0.6%]. though there was significant difference among the treatments. The significant and higher number of seeds/pod was with the application of sulphur (15kg/ha) might be due to it improves the metabolic enzymatic process in the plant thus increases the seeds/pod. Similar results were reported by **Laxmi *et al.*, (2020)**. Further increase in number of seeds/pod was observed with the application of boron(0.6%) might be due to increase in germination percentage of seed inside the pod. Similar findings were reported by **Padbhushan *et al.*, (2014)**.

Test weight (g)

Significant and maximum test weight (29.80g) was recorded in Treatment 9 [Sulphur (15 kg/ha) + Boron 0.6%], and though there was no significant difference among all treatments.

Seed yield (t/ha)

Significant higher seed yield (1.21t/ha) was obtained in treatment 9 [Sulphur (15kg/ha) + Boron 0.6%]. However, treatments 8 [Sulphur (15 kg/ha) + Boron 0.4%], treatment 6 [Sulphur (10 kg/ha) + Boron 0.6%] and treatment 5 [Sulphur (10 kg/ha) + Boron 0.4%] were statistically at par with the treatment 9 [Sulphur (15 kg/ha) + Boron 0.6%]. The significant and higher seed yield was with the application of sulphur (15/ha), might be due to sulphur in stimulation of cell division, photosynthetic process as well as formation of chlorophyll ultimately helped in realization of higher grain yield **Arunraj *et al.*, (2018)**. Further, maximum in seed yield with the application of boron (0.6%) might be due to physiological processes and plant growth also adequate nutrition is a critical for increases yield and quality of crops. Similar result was reported by **Banoth *et al.*, (2022)**.

Haulm yield (t/ha)

Significant and higher haulm yield (2.81t/ha) was recorded in treatment 9 [Sulphur (15 kg/ ha) + Boron 0.6%]. However, treatments 8 [Sulphur (15 kg/ha) + Boron 0.4%], treatment 6 [Sulphur (10 kg/ha) + Boron 0.6%] and treatment 5 [Sulphur 10 kg/ha + Boron 0.4% were statistically at par with the treatment 9[Sulphur(15 kg/ha) + Boron 0.6%]. The significant and higher haulm yield was observed with the

application of sulphur(15 kg/ha) might be due to sulphur enhances the plant metabolism and photosynthetic activity. Similar results have been reported by **Jat *et al.*, (2013)** in cowpea. Further, maximum haulm yield was observed with the application of boron(0.6%) might be due to required for cell differentiation, development and growth of pollen grains. It acts as a greater role in translocation of photosynthates, resulting in increased pollination and seed setting and plant metabolism **Movalia *et al.*, (2020)**.

Harvest Index (%)

The data revealed that treatment 9 [Sulphur (15 kg/ha) + Boron 0.6%)] recorded the higher harvest index (30.3%). However, treatment 8 [Sulphur (15 kg/ha + Boron 0.4%)], treatment 6 [Sulphur (10 kg/ha) + Boron 0.6%)],treatment 5 [Sulphur (10 kg/ha) + Boron 0.4%)]and treatment 4 [Sulphur (10 kg/ha) + Boron 0.2%)] were statistically at par with the treatment 9 [Sulphur (15 kg/ha) + Boron 0.6%)]. The significant and higher harvest index was obtained with the application of sulphur (15/ha) might be due to the part of aminoacid,which helps in chlorophyll formation, photosynthetic process, activation of enzymes and grain formation **Arunraj *et al.*, (2018)**. Further, maximum harvest index was observed with application boron (0.6%) might be due to affects cell division, carbohydrate metabolism, sugar and starch formation. Similar result was observed by **Padbhushan *et al.* (2014)**.

Economics

The result showed that maximum gross return (82,022.00 INR/ha), higher net returns (53,523.70 INR/ha), and highest benefit cost ratio (1.87) was recorded in treatment 9 [Sulphur (15 kg/ha) + Boron 0.6%)] as compared to other treatments [Table 3]. Higher gross returns, net returns, benefit cost ratio was recorded with application of sulphur (15kg/ha) might be due to maximum recovery from application of sulphur with less expenditure and higher seed and stover yields obtained from these treatments. These results are in conformity with those observed by **Anandamai *et al.*(2021)** in chickpea.

Table 1: Impact of sulphur levels and boron on growth parameters of green gram.

S No	Treatments	Plant height (cm)	Number of branches/Plant	Plant dry weight (g)	Number of nodules/plant	CGR (g/m ² /day)	RGR (g/g/day)
1.	Sulphur 5 kg/ha + Boron 0.2%	44.2	7.60	5.18	5.20	4.88	0.0238
2.	Sulphur 5 kg/ha + Boron 0.4%	44.5	7.80	5.78	5.80	4.88	0.0251
3.	Sulphur 5 kg/ha + Boron 0.6%	44.6	7.80	5.98	6.00	4.88	0.0260
4.	Sulphur 10 kg/ha + Boron 0.2%	44.7	8.00	6.18	6.20	4.88	0.0270
5.	Sulphur 10 kg/ha + Boron 0.4%	45.4	8.40	6.78	6.80	4.88	0.0303
6.	Sulphur 10 kg/ha + Boron 0.6%	45.9	8.60	6.98	7.00	4.88	0.0317
7.	Sulphur 15 kg/ha + Boron 0.2%	44.8	8.20	6.58	6.60	4.88	0.0292
8.	Sulphur 15 kg/ha + Boron 0.4%	46.9	8.73	7.18	7.20	4.88	0.0366
9.	Sulphur 15 kg/ha + Boron 0.6%	47.5	8.80	7.38	7.40	4.95	0.0409
10.	Control N:P:K (20:40:20 Kg/ha)	42.4	7.40	4.78	4.87	4.68	0.0230
	F-test	S	S	S	S	NS	NS
	Sem±	0.39	0.15	0.04	0.13	0.11	0.0008
	CD at 5%	1.15	0.45	0.13	5.20	--	--

Table 2: Impact of sulphur levels and boron on yield attributes of greengram.

S No	Treatments	Number of pods/plant	Number of seeds/pod	Test Weight (g)	Seed yield (t/ha)	Haulm yield (t/ha)	Harvest index (%)
1.	Sulphur 5 kg/ha + Boron 0.2%	22.2	8.00	26.00	0.79	2.34	25.3
2.	Sulphur 5 kg/ha + Boron 0.4%	22.8	8.20	26.60	0.83	2.38	26.1
3.	Sulphur 5 kg/ha + Boron 0.6%	23.0	8.60	26.80	0.89	2.44	26.9
4.	Sulphur 10 kg/ha + Boron 0.2%	23.2	8.80	27.40	0.95	2.50	27.7
5.	Sulphur 10 kg/ha + Boron 0.4%	26.0	9.40	28.00	1.02	2.57	28.1
6.	Sulphur 10 kg/ha + Boron 0.6%	27.4	9.80	28.40	1.08	2.63	28.4
7.	Sulphur 15 kg/ha + Boron 0.2%	24.0	9.00	27.60	0.99	2.54	28.1
8.	Sulphur 15 kg/ha + Boron 0.4%	28.8	10.07	29.20	1.18	2.71	30.1
9.	Sulphur 15 kg/ha + Boron 0.6%	29.4	10.33	29.80	1.21	2.81	30.3
10.	Control N:P:K (20:40:20 Kg/ha)	21.8	7.80	25.20	0.75	2.30	24.4
	F-test	S	S	NS	S	S	S
	Sem±	0.28	0.11	0.24	0.07	0.08	1.04
	CD at 5%	0.84	0.33	0.72	0.22	0.25	3.10

Table 3: Impact of sulphur levels and boron on economics of greengram.

S No	Treatments	Total cost of cultivation (INR/ha)	Gross Returns (INR/ha)	Net Returns (INR/ha)	B:C ratio
1	Sulphur 5 kg/ha + Boron 0.2%	26989.70	54158.00	27169.70	1.00
2	Sulphur 5 kg/ha + Boron 0.4%	27244.70	56806.00	29562.70	1.08
3	Sulphur 5 kg/ha + Boron 0.6%	27499.70	60778.00	33279.70	1.21
4	Sulphur 10 kg/ha + Boron 0.2%	27489.70	64750.00	37261.70	1.35
5	Sulphur 10 kg/ha + Boron 0.4%	27744.70	69384.00	41640.70	1.50
6	Sulphur 10 kg/ha + Boron 0.6%	27999.70	73356.00	45357.70	1.61
7	Sulphur 15 kg/ha + Boron 0.2%	27989.70	67398.00	39409.70	1.40
8	Sulphur 15 kg/ha + Boron 0.4%	28244.70	79952.00	51708.70	1.83
9	Sulphur 15 kg/ha + Boron 0.6%	28499.70	82022.00	53523.70	1.87
10	(Control) N:P:K 20:40:20 Kg/ha	26234.70	51510.00	25276.70	0.96

*Data was not subjected to statistical analysis.

CONCLUSION

Based on the above findings it can be concluded that application of Sulphur 15kg/ha and Boron 0.6% as foliar spray has performed better in growth parameters and yield attributes of green gram (*PDMI39-Samrat*) and also proven profitable.

REFERENCES

1. **Anandamai, D., Umesha, C., Ravi Kumar, P. (2021).** Effect of potassium and sulphur levels on yield attributes and economics of chickpea (*Cicer arietinum* L.) *The Pharma Innovation Journal*: **10**(11): 1813-1816.
2. **Arunraj, M., Vasanthi, D., Mansingh, M.D.I. (2018).** Effect Of Sulphur On Growth And Yield Of Greengram [*Vigna radiata*] *International Journal of Science, Environment and Technology*, **7**(5): 1861 – 1867.
3. **Banoth, MK, Sai Kumar, H., Priyanka, G., Malavath, V N., Umesha, C. (2022).** Influence of boron and zinc on growth and yield of green gram (*Vigna radiata* L.). *The Pharma Innovation Journal*; **11**(3): 1674-1678.
4. **Bhattacharjee, S., Singh, A.K., Manoj Kumar, Sharma, S.K. (2013).** Phosphorus, Sulfur and cobalt Fertilization Effect on Yield and Quality of Soyabean (*Glycine max* L. Merrill) in Acidic soil of Northeast India. *Indian Journal of Hill Farming* **26**(2) : 63-66.
5. **GOI (2020).** Agricultural Statistics at a Glance, Agricultural Statistics Division, Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi, <https://eands.dacnet.nic.in>.
6. **Imran, Khan, A., Inam, I., Ahmad, F., (2016).** Yield and yield attributes of Mungbean (*Vigna radiata* L.) cultivars as affected by phosphorus levels and under different tillage systems. *Cognet Food & Agriculture*, **2**: 1151982.
7. **Janaki, M., Donga, S., Parmar, K.B. (2020).** Effect of boron and molybdenum on summer green gram (*Vigna radiata* L.) (GM-4) under medium black calcareous soils: A review Proceedings of the *National Conference on Innovations in Biological Sciences* (NCIBS), January 10.
8. **Jat S.R., Patel B.J., Shivran A.C., Kuri B.R.,M Jat G. (2013).** Effect of phosphorus and sulphur levels on growth and yield of cowpea under rainfed conditions. *Annals of Plant and Soil Research* **15** (2): 114-117.

9. **Kokani, JM., Shah, KA., Tandel, BM., Bhimani GJ. (2015).** Effect of FYM, phosphorus and sulphur on yield of summer black gram and post-harvest nutrient status of soil. *The Bioscan*. **10**(1): 379-383.
10. **Laxmi, S., Patel, R., Singh, S., Choudhary, B., Gadhwal, R., Meena, R., Singh, Y. V. (2020).** Growth and yield response of Mungbean as influenced by sulphur and boron application. *Int.J.Curr.Microbial.App.Sci* **9**(3): 2788-2794.
11. **Mazed, K., Ferdous.J, Nazmul, Islam, P., Rahman, H. (2015).** Growth and yield of mungbean as influenced by potassium and sulphur. *Annals of Biological Research*, **6** (1):6-10.
12. **Movalia, Dr., Donga, S., Parmar, KB. (2020).** Effect of boron and molybdenum on summer green gram (*Vigna radiata* L.) (GM-4) under medium black calcareous soils. Proceedings of the National Conference on Innovations in Biological Sciences (NCIBS), Januray 10.
13. **Padbhushan, R., Dinesh, K. (2014).** Influence of soil and foliar Applied Boron on Green Gram in Calcareous Soils. *IJAEB*; **7**(1): 129-136.
14. **Parry, SA., Jaiswal, P.C, Parry, FA., Ganie, SA., Masood, A. (2017).** Effect of different levels of nitrogen and sulphur on growth, nodulation and yield of green gram (*Vigna radiata* L.). *Legume Research An International Journal*.
15. **Rao, C.S., Singh, K.K., and Ali, M. (2001).** Sulphur: a key nutrient for higher pulse production. *Fertilizer news*. **46**(10): 51-56.
16. **Singh, A.K., Khan, M.A., Srivastava, A., (2014).** Effect of boron and molybdenum application on seed yield of mungbean. *Asia. J. Biol. Sci.*, **9**(2), 169-172.
17. **Sengupta, K., Tamang, D. (2015).** Response of green gram to foliar application of nutrients and brassinolide. *Journal Crop Weed*, **11**(1): 43-45.