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Influence of Sulphur on morpho-physiological parameters of Rapeseed (*Brassica napus* L.)

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Abstract

The present investigation entitled "Influence of Sulphur on morpho-physiological parameters of Rapeseed (*Brassica napus* L.)" was conducted during 2016-17 at the experimental farm Department of Agriculture, Mata Gujri College, Fatehgarh Sahib, Punjab, India. The experiment was laid out in Factorial Randomized Block Design with three replication and twelve treatments. The treatments consisted of T_1: V_1S_1(PBT-37 + Control), T_2: V_1S_2(PBT-37 + 15kg/ha), T_3: V_1S_3 (PBT-37 + 30 kg/ha), T_4: V_1S_4 (PBT-37 + 60 kg/ha), T_5: V_2S_1(T-17 + Control), T_6: V_2S_2 (T-17 + 15 kg/ha), T_7: V_2S_3 (T-17 + 30 kg/ha), T_8: V_2S_4 (T-17 + 60 kg/ha), T_9: V_3S_1 (T-15 + Control), T_{10}: V_3S_2 (T-15 + 15 kg/ha), T_{11}: V_3S_3 (T-15 + 30 kg/ha), T_{12}: V_3S_4 (T-15 + 60 kg/ha). Application of different levels of fertilizers increased the growth characters of rapeseed. The maximum plant height was in variety PBT-37 and sulphur @ 60 kg/ha, leaf area index in variety T-17 and 60 kg/ha S and dry matter accumulation in T-17 and sulphur of 60 kg/ha these results suggested that the optimum production of rapeseed can be obtained with highest dose of sulphur and in T-17 variety.

Keywords: growth, rapeseed, sulphur

INTRODUCTION

Rapeseed (*Brassica napus* L.) is an important oilseed crop of *Rabi* season that requires relatively cool temperature. It is thermo sensitive as well as photo sensitive crop. It is cultivated both under irrigated (79.2%) and rain fed (20.8%) condition (Shekhawat *et al*. 2012). All the major nutrients play an important role in inclining

vegetative growth of rapeseed. However, Sulphur is the key component of balanced nutrient application for higher growth of crop (Mondal and Wahhab, 2001). Sulphur application greatly influences the chlorophyll synthesis, carbohydrate as well as protein metabolism. It is essential for synthesis of amino acids, proteins, oils, component of vitamin A and activates enzymes in plant (Anjum *et al*. 2016). The growth, development and productivity of cruciferous crops have been hampered in last few decades because of unbalanced plant nutrient in soil. Continuous mining of sulphur from soils has led to widespread sulphur deficiency and negative soils budget. The selection of suitable varieties is an important factor incline crop response to applied nutrients and thereby economic yield. With increase in irrigated area in most parts of the country including Punjab, it becomes imperative to work out the response of rapeseed sulphur application under irrigated condition. The proper selection of genotype is equally important in getting the high growth and ultimately yield of crop.

MATERIALS AND METHODS

Three varieties V_1: PBT-37, V_2: T-17, V_3: T-15 was used for present study. All the recommended cultural practices were adopted during the course of planting. The experiment was carried out in Factorial Randomized Block Design (FRBD) with 12 treatments with T_1: V_1S_1(PBT-37 + Control), T_2: V_1S_2(PBT-37 + 15kg/ha), T_3: V_1S_3 (PBT-37 + 30 kg/ha), T_4: V_1S_4 (PBT-37 + 60 kg/ha), T_5: V_2S_1(T-17 + Control), T_6: V_2S_2 (T-17 + 15 kg/ha), T_7: V_2S_3 (T-17 + 30 kg/ha), T_8: V_2S_4 (T-17 + 60 kg/ha), T_9: V_3S_1 (T-15 + Control), T_{10}: V_3S_2 (T-15 + 15 kg/ha), T_{11}: V_3S_3 (T-15 + 30 kg/ha), T_{12}: V_3S_4 (T-15 + 60 kg/ha). Observations were recorded on randomly selected plants with different growth characters *i.e.* plant height (cm), leaf-area index (LAI), dry matter accumulation plant^{-1} (g).

Leaf area index = Total leaf area (cm^2)/ Ground area

RESULTS AND DISCUSSION

The analysis of variance revealed significant differences among the treatments for all the plant growth attributes under study.

Plant Height

Data recorded on the effect of sulphur on three different varieties PBT-37, T-17 and T-15 on different days after sowing presented in Table 1. Rapeseed variety PBT-37 recorded maximum plant height (49.0, 93.0 and 136.7cm) on 30, 60 and 90 DAS among the other varieties. However, sulphur rate also marked variation in plant height at different days after sowing. The highest plant height had been observed in 60 kg S ha^{-1} *i.e.* 50.8, 95.3 and 139.0cm on 30, 60 and 90 DAS whereas minimum was recorded in Control. Possible reason behind the longest height of plant was the genetic makeup of plant or because sulphur enhances cell division, cell elongation and meristematic tissue activity in plants (Rashid *et al.* 2010). This result agrees well with those of Nepalia (2005), Singh and Meena (2004) on mustard.

Leaf area Index

The data revealed that maximum leaf area index was observed in T-17 variety which was 0.62, 3.2 and 3.6 at 30, 60 and 90 DAS. This was at par with PBT-37 and both recorded significantly superior results. Also the 60 kg S ha^{-1} was recorded highest leaf area index which was 0.71, 3.4 and 3.8 at 30, 60 and 90 DAS. The reason behind this was might be due to adequate availability of sulphur attributes to better nutritional environment for plant growth at active vegetative stage because of enhancement in cell multiplications, cell elongation and cell expression in the plant body which ultimately enhanced the leaf area index at higher sulphur levels (Pan *et al*. 2010). Sulphur at S (60 kg/ha) also enhanced LAI over other treatments. The positive effect of sulphur on LAI has also been reported in opium poppy (Intodia and Sahu, 2005), in rice (Ali *et al*. 2004), in summer green (Kumawat *et al*. 2005)

Dry matter accumulation

It is evident from the data that DMA $plant^{-1}$ increased as progressed, the values was maximum at harvest. It revealed that T-17 variety resulted higher dry matter accumulation which was 2.0, 21.3 and 25.5 at 30, 60 and 90 DAS whereas, higher amount of sulphur also recorded highest data in DMA *i.e.* 3.5, 22 and 26.2 at 30, 60 and 90 DAS. This might be due to better climatic adaptation because of genotype is highly dependent on environmental factors. Increasing levels of sulphur correspondingly enhanced DMA $plant^{-1}$. This might be due to the increasing leaf area index which results in inclining the capture of solar radiation within the canopy and increase production of dry matter (Sharifi, 2012).

Table1. Effect of rate of sulphur and cultivars on Growth attributes

	Plant height (cm)			**Leaf area Index**			**Dry matter Accumulation (g)**		
Treatment	**30 DAS**	**60 DAS**	**90 DAS**	**30 DAS**	**60 DAS**	**90 DAS**	**30 DAS**	**60 DAS**	**90 DAS**
Varieties									
V1	49.0	93.0	136.7	0.60	3.1	3.5	2.8	20.8	25
V2	47.8	90.5	134.3	0.62	3.2	3.6	2.9	21.3	25.5
V3	41.8	82.0	125.9	0.49	2.7	3.0	2.5	17	22.1
SE±	1.1	1.9	1.7	0.01	0.03	0.04	0.03	0.2	0.2
CD (0.05)	3.3	2.6	5.1	0.2	0.1	0.1	0.1	0.7	0.6

Rate of sulphur									
S1	40.3	80.4	25.0	0.39	2.6	2.9	2.0	16.3	21.5
S2	44.5	85.7	129.2	0.48	2.8	3.2	2.5	19.1	23.7
S3	49.0	92.7	135.9	0.66	3.3	3.6	3.1	21.3	25.4
S4	50.8	95.3	139.0	0.71	3.4	3.8	3.5	22	26.2
SE ±	1.3	2.2	2.1	0.02	0.04	0.06	0.04	0.2	0.2
CD (0.05)	3.8	3.4	3.1	0.1	0.1	0.2	0.1	0.9	0.8

Conclusion

From the above results, it can be concluded that application of Sulphur fertilizer to rapeseed varieties resulted in stimulated growth of plant which had significant effects on plant height, leaf area index and dry accumulation matter. As growth parameters increased with an increased dose of fertilizer application and selection of right variety. Thus, it may be concluded that 60 kg/ha dose of fertilizer application and T-17 variety performed better and increased morpho-physiological growth of plant.

Application of Research: Beneficial to farmer and improve soil health

Research category: Influence of Sulphur on morpho-physiological parameters of Rapeseed (*Brassica napus* L.)

Abbreviations:

Kg/ha: Kilogram per hectare

G: Gram

SEm: Standard error mean

CD: Critical Differences

Cm: Centimetre

DMA: Dry matter accumulation

DAS: Days after sowing

FRBD: Factorial Randomized Block Design

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References

1. Ali M M, M S Mian, A Islam, J A Begum and A K M Ferdous.2004. Interaction effects of sulphur and phosphorous on wet land rice. *Asian Journal of Plant Science* **3**(5): 597-601.
2. Anjum M M and Ali N. 2016. Yield performance of canola as affected by different sulphur levels and application timings. *Journal of Medical Science*. **1**(3): 78-82.
3. Intodia S K and M P Satu 2005. Effect of sulphur fertilization on growth of opium poppy in calcareous soils of south Rajasthan. *Indian Journal of Plant Physiology* **10**(1):90-93.
4. Kumawat R N, Rathore P S and Talwar H S. 2005. Effect of sulphur and iron on crop growth attributes in summer green gram. *Indian Journal of Plant Physiology* **10** (1): 86-89.
5. Mondal M R I and M A Wahhab. 2001. Production Technology of Oilcrops. *Oilseed Research Centre, BARI, Joydebpur, Gazipur, Bangladesh*. Pp. **4** -30.
6. Nepalia V. 2005. Influence of weed control and sulphur on growth, yield and economics of mustard production. *Research on Crops* **6** (1): 35-38.
7. Pan X, Caldwell C D, Falk K C and Lada R.2010. The effect of cultivar, seeding rate and applied nitrogen on *Brassica carinata* seed yield and quality in contrasting environments. *Canada Journal of Plant Science*. **92**: 961-971.
8. Rashid M M, Masud, Biswas P K and Hossain M A. 2010. Growth parameters of different mustard (*Brassica campestris* L.) varieties as affected by different levels of fertilizers. *Bulletin of the Institute of Tropical Agriculture in the Kyushu University*. **33**:73-81.
9. Sharifi R S. 2012. Sulphur fertilizers effects on grain yield and the sum of physiological indices of canola (*Brassica napus* L.). *Annals of Biological Research*. **3**(11): 5034-5041.
10. Shekhawat K, Rathore S S, Premi O P, Kandpal K and Chauhan J S. 2012. Advances in Agronomic management of Indian mustard (*Brassica juncea* L. Czernj Cosson.). *International Journal of Agronomy*. **Vol**. 2012. Article ID. 408282.
11. Singh A and N L Meena. 2004. Effect of nitrogen and sulphur on growth, yield attributes and seed yield of mustard (*Brassica juncea*) in eastern plains of Rajasthan. *Indian Journal of Agronomy* **49**(3): 186–188.