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Assessment the effect of sulphur dose on onion (*Allium Cepa*) in Koshi region

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Abstract

Onion has high demand for the sulphur which affects the Bulb Quality and Productivity but it should be applied in the field carefully so, as it produces acidic effects and adversely affects the plant. The present on farm trial was carried out to study the effect of Sulphur application on the yield and its attributes at 8 farmers field of Madhepura district under supervision of Krishi Vigyan Kendra Madhepura, Bihar Agriculture University, Sabour in Rabi Season from October- 2018 to April - 2019. It was arranged in Randomized Block Design with 3 treatments and 5 replications. Yield attributes for all treatments are significant except neck thickness and neck diameter. Maximum Yield (295q/ha), bulb size (5.56cm), neck thickness (5.8cm) Plant height (51.6cm), Number of leaves (8.3) and length of leaf (39.9cm) were recorded from the doze of 30 kg Sulphur per hectare. Economically, highest net monetary return of Rs. 132494 per hectare was obtained with the application of Sulphur @30 kg/ha. The application of Sulphur at this rate had been found to be non tedious, economically feasible and more convenient.

Keywords: *Allium Cepa* L., Sulphur, Yield, Economics

Introduction

Onion (*Allium cepa* L.) belongs to family Aliceae whose origin is considered to be Central Asia. It is widely grown for the vegetables and spices (Mishu *et al.*, 2013) [7]. Onion pertain high socio-economic importance in India. Onion contains 1285 thousand hac area with 23262 MT production whereas rest of the production is used for self utilization. The economics of the onion bulb and these attributes depends upon Nitrogen, Phosphorous, Potassium and Sulphur (Kurtz and Ernani, 2010) [8]. Onion had been reported to required high amount of Sulphur than other nutrients (Mishu *et al.*, 2013) [7]. Less amount of Sulphur whenever be advocated from the optimum doze, it may limits yield and its attributes at any stage of crop production (Mishu *et al.*, 2013) [7].

From few previous decades, the application of Sulphur combination to other fertilizers had taken an admirable position in the production as far as trade, quality and fertilizer use efficiency is concerned. Sulphur is secondary macro-nutrient which have positive effects on the family as well as various variety of onion and whose application leads to several effect on the soil as well as plant's physiology *viz* – reducing soil and plants pH, improving soil water plant relationship, availability of various nutrients such as Phosphorous, Iron, Manganese and Zinc (El-Shafie and ElGamaily, 2002; Bloem *et al.*, 2004; Marschner, 1998) [4, 5, 6]. Onion is relatively poor source of certain nutrients (i.e., fats, carbohydrates and proteins) (McCance *et al.*, 1960) [1] but is generally valued for its well known characteristic flavor. The known compounds of raw and cooked onions (and other allium species) are rich in sulphur compounds of which mono-, di- and tri-sulphate compound predominates (Oaks *et al.*, 1964; Brodniti *et al.*, 1965) [2, 3].

Trade market of onion exclusively depends upon the flavor and low pungency onion cultivar. These factors had been studied to be dependent on the Sulphur accumulation (Gallina *et al.*, 2012) [10]. Thus, the use of elemental Sulphur in the fertilizer mixture shall be an alternative for increasing the nutrient control and meeting plant requirement (Horowitz, 2003) [11]. The variation in cultivar differs in their efficiency in absorbing the Sulphur content. Thus, a study is conducted on the Effect of Sulphur on the yield and its attributes using Nasik red variety at farmers field of, Madhepura district, Bihar.

Methods and Material

Field experiment was conducted in Rabi Season in year 2018-19 at 8 farmers field of Madhepura district under supervision of KVK, Madhepura. The KVK, Madhepura was

located at 25°55'01.14"N and 86°48'22.30"E with 153ft. elevation from the mean sea level. GPS sketch of the experimental station is shown in below figure.

The seed beds were prepared and sown in October - 2018 whereas transplanting took place at November- 2018 in Randomized Block Design which consists of 3 treatments and 5 replications (Table number - 01). Each plot size was kept at 1.5×1.5m² and the plant spacing at 10×15cm². The recommended dose of fertilizer for NPK @120:60:80 were uniformly applied in all the treatments but Sulphur were varied with no use, 20kg/ha and 30kg/ha as a basal dose. Urea, DAP and MOP were applied as a fertilizer for nitrogen, phosphorous and potassium respectively while the source of Sulphur was granule Sulphur (80%). Certain amount of compost had also been applied so far to maintain physico-chemical equilibrium of soil. To prevent the loss of nitrogen, one-third of Nitrogen with full Phosphorous and Potassium were applied before transplanting while two-third of nitrogen was applied at 30 days after transplanting and 60 days after transplanting respectively. Regular irrigation and weeding with plant protection measures were acquired if found necessary. Economical description of the fixed cost is well tabulated in table – 03. Finally, the crop is harvested at April-2019. Bulb Size (cm), Bulb Yield (q/ha), Neck Length (cm), Plant height (cm), Number of Leaves, Leaf length (cm), Gross Cost, Gross return and B: C ratio were also tabulated and

subjected to the F-test using ANOVA in Excel Sheet. The above mentioned data had been designated from table number 2, 3 and 4.

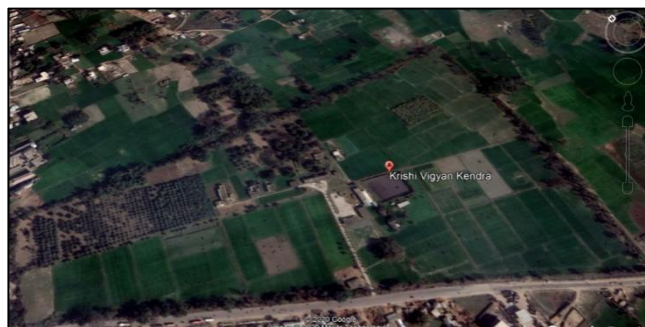


Fig 1: GPS sketch of KVK Madhenpura, Bihar Agriculture University, Sabour, Bihar, India

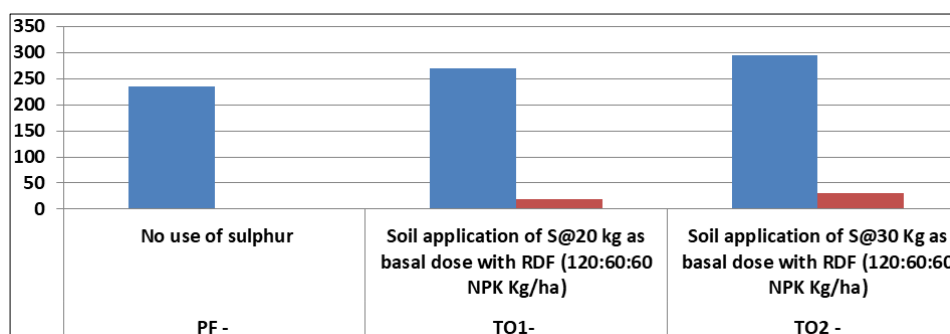
Results

Table 1: Description of the treatments

S.No.	Treatment No.	Treatment Description
1.	Farmers Practice	No. use of Sulphur
2.	T01	Soil application of S@20 kg as basal dose
3.	T02	Soil application of S@30 kg as basal dose

Table 2: Yield and its attributes

Treatment Description	Bulb Size (cm)	Bulb Yield (q/ha)	Bulb weight (gm)	Neck Length (cm)	Plant height (cm)	Number of Leaves	Leaf length (cm)
Farmers practice - No. use of Sulphur	4.42	234	84.6	4.2	44	5.2	35.2
T01-Soil application of S@20 kg as basal	4.76	269	90.8	5.1	48.2	6.7	38.6
T02-Soil application of S@30 kg as basal	5.56	295	97.4	5.8	51.6	8.3	39.9
Standard Error	0.008	62.983	1.645	0.015	2.489	0.044	1.318
Critical Difference	0.017	129.241	3.375	0.031	5.109	0.090	2.706



Graph 1: Changes in yield on different doses of sulphur

Table 3: Fixed Cost Description

SL	Operation	Unit of an input and rate	Amount
1	land preparation		
	Ploughing with soil turning plough	One tractor for 3 hours @ Rs. 450 per hour	1350.00
	final preparation	Two times ploughing with tractor and planking for 4 hour @ Rs. 450 per hour	1800.00
2	Seedling raising		
	Preparation of beds (1.5x1.5 m ²) 15 beds	5 Man days @ Rs. 247	1235.00
	Cost of seed	10 kg Seed @ Rs.600 per kg	6000.00
	Compost & manures		1000.00
	Aftercare		1000.00
3	Layout	20 Man days @ Rs. 247	4950.00
4	Transplanting	50 Man days @ Rs. 200	10000.00
5	Manures and fertilizers		
	Compost	15 t ha ⁻¹ @ Rs. 1 per kg	15000.00
	N-120 kg through urea	260 kg urea @ Rs. 7 per kg	1820.00

	P ₂ O ₅ - 60 Kg through SSP	375 kg SSP @ Rs. 9 per kg	3375.00
	K ₂ O- 60 Kg through MOP	99.6 kg MOP @ Rs. 16 per kg	1594.00
6	Weedicide and lhoeing		2982.00
7	Irrigation	10 irrigation @ Rs. 700 per irrigation	7000.00
8	Plant protection measures	spray each of fungicide (carbendazim + mancozeb @ 2.5 g/l) and insecticide (Imidachloprid @ 1 ml/l) along with sticker @ 1ml/l	3000.00
9	Harvesting, cleaning	40 Man days @ 200	8000.00
10	Miscellaneous		1500.00
	Total		71606

Sulphur requirements is taken in the experiment is notconsidered in the

fixed cost due to the fact that the experiment is experimented from economic point of view.

Table 4: Economics

Treatment Description	Yield (q/ha)	Gross cost	Gross Return	Net Return (Rs/ha)	B:C Ratio
No. use of Sulphur	234	71606	163800	92194	2.28:1
Soil application of S@20 kg as basal	269	73206	188300	115094	2.57:1
Soil application of S@30 kg as basal	295	74006	206500	132494	2.79:1



Fig 1: On Farm Trial at farmers field at bhatkhoda village, Madhepura

Discussion

Sulphur application in this experiment had been found to produce positive effect towards Bulb Size (cm), Bulb Yield (q/ha), Neck Length (cm), Plant height (cm), Number of Leaves and Leaf length (cm). Increase in the trend had been advocated by the other researchers viz - Al-Fraihat (2009) [12], Mishu *et al.*, (2013) [7], Souza *et al.*, (2015) [13]. Number of leaves, Leaf length and Plant height in the plant was found to be highest 8.3, 39.9cm and 51.6 respectively at application of 30kg S per hectare which shows high photosynthetic rate and thus rich accumulation of source-sink reserves. Tripathy *et al.* (2013) [14], Meher *et al.*, (2015), Souza *et al.*, (2015) [13] had also been reported similar trends. However, Neck Length increased but found non-significantly. Mishu *et al.*, 2013 [7], Tripathy *et al.* 2013 [14] and Souza *et al.*, 2015 [13] had also reported the similar results.

Bulb size in this experiment is the measure of bulb diameter which had been found to increase Both the diameters polar and equatorial whenever determined gives the best approximation of 5.56cm at the application of Sulphur at 30kg/ha. Average bulb weight is an important yield attributing character which directly reflects the yield. Significant highest bulb weight was recorded 97.4gm at application of 30kg S per ha. Abbey *et al.* 2002 and Tripathy *et al.* 2013 [14] had found the similar observation.

Yield is the most promising character which was to be calculated in this experiment. The productivity of the Bulb

yield was influenced by the application of Sulphur shown in the graph - 2. Maximum yield of 295kg/ha was recorded at an application of 30kg Sulphur per hectare as compared with the other treatments.

Economically, highest net monetary return of Rs. 1324941 per hectare with B:C ratio 2.79:1 was obtained with the application of Sulphur at 30kg/ha as compared to the other treatments. The experiment requires the fixed cost of Rs. 71606 per hectare and the variations of total input cost were only due to Sulphur application. The fixed cost data and economics were well tabulated in table 3 and 4. Similar trends of economics had been reported by Patel *et al.* 2011 and Tripathy *et al.* 2013 [14].

Conclusion

The finding from the experimental analysis of effect on the Sulphur on the onion in Rabi 2018-19 at KVK of district Madhepura invokes that application of Sulphur at 30kg/ha had remarkable effect on the yield and its attributes for onion cultivar. Thus, the recommendation of Sulphur @30kg/ha would be suitable recommendation for the onion growers at district Madhepura, Bihar. The application of Sulphur had been found to be practically convenient as well as economically feasible as the yield point of view.

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