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Effect of different sources and levels of sulphur on yield and yield attributes in onion under central dry zone of Karnataka

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Abstract
A field experiment was conducted to study the effect of different sources and levels of sulphur on yield and yield attributes in onion under central dry zone of Karnataka at Zonal Agricultural and Horticultural Research Station, Babbur farm, Hiriyur. The experiment was laid out in Randomized Complete Block Design with nine treatments and three replications during 2019 – 20. Among different treatments, plants treated with RDF + sulphur @ 30 kg ha^{-1} through gypsum recorded maximum polar diameter, equatorial diameter, average bulb weight, bulb yield per plot, marketable bulb yield, total bulb yield, per cent A grade bulb yield, per cent B grade bulb yield.

Keywords: levels of sulphur, agricultural, onion

Introduction
Onion (*Allium cepa* L.), 2n=16, is an important and widely grown popular vegetable crop belonging to the family Alliaceae. Onion is considered as the second most important vegetables grown in the world after tomato, and it is one of the commercial vegetable crops in India. Onion is an indispensable item in every kitchen as vegetable and condiment, used to flavour many of the foodstuffs. Therefore, onion is popularly referred to as 'Queen of the kitchen'. In addition, onion is also used as salad and pickle. Recently, onion is employed by processing industry for preparing dehydrated onion products like powder and flakes.
Onion plants are known for their affinity to sulphur. Sulphur is identified as fourth major nutrient ranks after N, P, K, which is essentially required for growth and development of the crop. Sulphur is considered as the secondary nutrient and it is found to increase the growth, yield and quality of important vegetable crops like onion.
The sulphur requirement of crops is almost similar to that of phosphorus.
Besides sulphur is a major constituent of secondary compounds *viz.*, allin, cycloallin and thiopropanol which not only influence the taste, pungency, storage life and medicinal properties of onion and garlic but also inducing resistance towards pests and diseases (Brown and Morra, 1997) [1].

Material and Methods
The experiment was carried at Zonal Agricultural and Horticultural Research Station, Babbur farm, Hiriyur, Karnataka, The experiment was laid out in Randomized Complete Block Design (RCBD) with 9 treatments and three replications (Table 1).

Table 1: Treatment details

Treatment Number	Treatment details
T_1	Control (RDF *i.e* NPK @125:75:125 kg ha^{-1}).
T_2	RDF + sulphur @ 15 kg ha^{-1} through gypsum.
T_3	RDF + sulphur @ 30 kg ha^{-1} through gypsum.
T_4	RDF + sulphur @ 15 kg ha^{-1} through elemental sulphur (Granular form)
T_5	RDF + sulphur @ 30 kg ha^{-1} through elemental sulphur (Granular form)
T_6	RDF + sulphur @ 15 kg ha^{-1} through ammonium sulphate.
T_7	RDF + sulphur @ 30 kg ha^{-1} through ammonium sulphate.
T_8	RDF + sulphur @ 15 kg ha^{-1} through potassium sulphate.
T_9	RDF + sulphur @ 30 kg ha^{-1} through potassium sulphate

The investigation entitled "Effect of different sources and levels of sulphur on yield and yield attributes in onion under central dry zone of Karnataka, at Zonal Agricultural and Horticultural Research Station, Babbur farm, Hiriyur, Karnataka, during *kharif* season of the year 2019-20. Seeds of Arka Kalyan variety were sown in flat nursery beds on 27th August 2019 in *kharif* season. Transplanting of 56 days old onion seedling were done on 20th October, 2019 in the main field with gross plot size of 3 × 2 m^2, with the spacing: 15 X 10 cm. The crop was fertilized with recommended nitrogen, phosphorus and potassium@ 125:75:125

kg NPK per hectare in the form of urea, single superphosphate and muriate of potash, respectively. Out of recommended dose, 50 per cent of N and full dose of P and K was applied as a basal dose and remaining 50 per cent of N was applied after one month of transplanting as top dressing. Whereas sulphur was applied in the soil as basal dose through gypsum, elemental sulphur, ammonium sulphate and potassium sulphate. The treatments were allotted randomly into blocks. Light Irrigation was given immediately after transplanting and then experimental plots were irrigated on weekly interval basis. Subsequently, plots were irrigated depending upon the weather and soil condition. Four hand weeding were carried out during the crop growth period and plots were kept weed free. The crop was harvested at maturity when the plants turned yellowish with necrotic leaf tips coupled with neck fall in more than 50% -75%. The plants were uprooted from the net plot area of each treatment separately and the soil adhered to the bulbs was removed.

Result and Discussion

In the present investigation, the plants provided with RDF + sulphur @ 30 kg ha^{-1} through gypsum (T_3) recorded maximum polar diameter of bulb (6.09 cm) and equatorial bulb diameter (5.98 cm), as compared to rest of the treatments (Table 2). This enhanced yield attributes might be due to availability of sulphur for a longer period, which helped in better growth and development of the crop and increased uptake of N, P, K and sulphur, it might have resulted in higher production of photosynthates and their translocation to sink. Also the calcium is supplied through gypsum helps in better growth and development. Increasing sulphur availability has been associated with enlargement of bulb and increasing bulb weight. These results are in accordance with Jaggi (2005b); Wani and Chatoo (2005) [8]; Tripathy *et al*. (2013) [7] and Tripathy *et al*. (2016) [6], who also founded a significant increase in yield and yield attributes with the application of sulphur in the form of gypsum.

Application of different sources and levels of sulphur impacted significantly for bulb yield per plot, total bulb yield per hectare and marketable bulb yield and bulb characters (Table 3). The plants provided with RDF + sulphur @ 30 kg ha^{-1} through gypsum (T_3) recorded maximum bulb yield per plot (21.90 kg $plot^{-1}$), total bulb yield (36.50 t ha^{-1}), marketable bulb yield (35.03 t ha^{-1}) A grade bulb yield (56.23 %), B grade bulb yield (39.45 %) over other treatments. Higher bulb yield response of onion with the application of gypsum ($CaSo_4.2H_2o$) along with the recommended dose of fertilizers might be due to better and longer period availability of sulphur and supply of extra calcium resulting in development of efficient photosynthetic systems as a result of activation of many enzymes which might have increased the growth rate through increased phosphorylation process in photosynthesis (Noggel and Fritz, 1991) [3].

Increased vegetative growth parameters and better per cent plant establishment which are directly proportional to number of bulbs and size of bulbs produced. Enhanced growth rate resulted higher production and better partitioning of the photosynthates and their accumulation in the bulbs and the storage organs of the onion. Similar results were also reported in onion crop by Shinde *et al*. (2013) [5]; Tripathy *et al*. (2013) [7]; Pradhan *et al*. (2015) [4] and Tripathy *et al*. (2016) [6], who also documented significantly higher bulb yield of onion with application of sulphur through gypsum.

Table 2: Effect of different sources and levels of sulphur on polar diameter of bulb, equatorial diameter of bulb of onion at harvest.

Treatments	Polar diameter of bulb (cm)	Equatorial diameter of bulb (cm)
T_1 – Control (RDF)	5.00	5.33
T_2 – RDF + sulphur @ 15 kg ha^{-1} through gypsum	5.75	5.60
T_3 – RDF + sulphur @ 30 kg ha^{-1} through gypsum	6.09	5.98
T_4 – RDF + sulphur @ 15 kg ha^{-1} through elemental sulphur (Granular form)	5.61	5.60
T_5 – RDF + sulphur @ 30 kg ha^{-1} through elemental sulphur (Granular form)	5.63	5.80
T_6 – RDF + sulphur @ 15 kg ha^{-1} through ammonium sulphate	5.39	5.70
T_7 – RDF + sulphur @ 30 kg ha^{-1} through ammonium sulphate	5.60	5.76
T_8 – RDF + sulphur @ 15 kg ha^{-1} through potassium sulphate	5.31	5.53
T_9 – RDF + sulphur @ 30 kg ha^{-1} through potassium sulphate	5.41	5.73
S. Em±	0.11	0.04
CD at 5%	0.33	0.13

Table 3: Effect of different sources and levels of sulphur on yield and yield attributes of onion.

Treatments	Avg. bulb weight (g)	Bulb yield (kg $plot^{-1}$)	Total bulb yield (t/ha)	Marketable bulb yield (t/ha)	Grade wise yield (%)		
					A	B	C
T_1 – Control (RDF)	77.09	16.80	29.52	23.93	52.23	35.33	12.44
T_2 – RDF + sulphur @ 15 kg ha^{-1} through gypsum	104.02	19.30	32.16	29.87	54.36	37.23	8.41
T_3 – RDF + sulphur @ 30 kg ha^{-1} through gypsum	110.08	21.90	36.50	35.03	56.23	39.45	4.32
T_4 – RDF + sulphur @ 15 kg ha^{-1} through elemental sulphur (Granular form)	101.35	18.90	31.50	29.40	53.89	36.90	9.21
T_5 – RDF + sulphur @ 30 kg ha^{-1} through elemental sulphur (Granular form)	109.03	21.30	35.50	33.80	55.87	38.67	5.46
T_6 – RDF + sulphur @ 15 kg ha^{-1} through ammonium sulphate	92.04	18.30	30.50	28.28	53.23	36.80	9.97
T_7 – RDF + sulphur @ 30 kg ha^{-1} through ammonium sulphate	94.81	20.80	34.66	31.98	54.90	37.90	7.20
T_8 – RDF + sulphur @ 15 kg ha^{-1} through potassium sulphate	88.70	18.28	30.46	28.80	53.89	36.69	9.42
T_9 – RDF + sulphur @ 30 kg ha^{-1} through potassium sulphate	91.54	20.30	33.83	30.83	55.23	37.66	7.11
S. Em±	3.06	0.85	1.29	1.50	0.77	0.73	0.78
CD at 5%	9.17	2.54	3.86	4.50	2.32	2.18	2.33

Conclusion

It can be concluded that application of sulphur at the rate of 30 kg ha^{-1} in the form of gypsum along with the recommended dose of fertilizers (NPK @ 125:75:125 kg ha^{-1}) reported maximum yield and yield attributes. Hence, gypsum is the superior source of sulphur to meet the sulphur demand of onion. Thus, the application of sulphur at the rate of 30 kg ha^{-1} in the form gypsum along with the recommended dose of fertilizers (NPK @ 125:75:125 kg ha^{-1}) is very essential for achieving the higher yield of onion.

References

1. Brown PD, Morra MJ. Control of soil-borne plant pests using glucosinate-containing plants. Adv Agron. 1997; 61:161-231.
2. Jaggi RC. Sulphur as production and protection agent in onion (*Allium cepa* L.). Indian J Agric Sci. 2005b; 75(12):805-808.
3. Noggel GR, FRITZ GT. Introductory plant physiology. Prentice Hall of India Pvt. Ltd., New Delhi, 1991, 233-271.
4. Pradhan M, Pattnaik AK, Tripathy P, Mallikarjunarao AK, Sahoo BB, Lenka J. Influence of sulphur fertilization on nutrient uptake of onion. J Crop Weed. 2015; 11:134-138.
5. Shinde KG, Pawar PK, Bhalekar MN, Patil BT. Response of onion to sulphur applications for yield, quality and its storability. J Agric Res Tech. 2013; 38(3):374-379.
6. Tripathy P, Sahoo BB, Patel D, Dash DK. Efficacy of sulphur on growth, yield and bulb quality in onion (*Allium cepa* L.). J Spices Aromatic Crops. 2016; 25(1):60-64.
7. Tripathy P, Sahoo BB, Priyadarshini A, Das SK, Dash DK. Effect of sources and levels of sulphur on growth, yield and bulb quality in onion (*Allium cepa* L.). Int J. Bio-resource Stress Manag. 2013; 4(4):641-644.
8. Wani MA, Chatoo MA. Effect of different sources and doses of sulphur on the performance of garlic (*Allium sativum* L.). Hort J. 2005; 18(2):114-116.