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Effect of sulphur levels on growth and yield of onion (*Allium cepa* L.)

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ABSTRCT

A field experiment was conducted during the *rabi* season of 2019-2020 at research farm, J.N.K.V.V., College of Agriculture, Tikamgarh (Madhya Pradesh) to study the "Effect of different levels of sulphur on growth and yield of onion (*Allium cepa L.)*". The treatments consisted of four levels of sulphur, viz.(S_0- 0kg S/ha, S_1- 20 kg S/ha, S_2- 40 kg S/ha and S_3 - 60 kg S/ha) were laid out in Randomized Block Design with three replications. Result showed significant influence on growth and yield attribute for different sulphur levels. Maximum plant height (62.62 cm), number of leaves per plant (10.25), leaf length (55.45 cm), leaf diameter(0.95 cm), neck thickness (1.88 cm), bulb length (5.73 cm), polar diameter (5.99cm), equatorial diameter (6.11 cm), bulb weight (91.32 g) bulb yield (20.30 kg/plot) and bulb yield (282.00 q/ha) were recorded with application of sulphur 60 kg/ha. Which justify its superiority over rest of the treatment while minimum Growth and Yield parameters were recorded 0kg S/ha.

Key words: *Growth, Onion, Sulphur, Yield*

Introduction

Onion (*Allium cepa* L.) is an important bulbous vegetable crop belongs to the family Alliaceae. Many virtues have been attributed in Charaka -Samhita and the references of onion have also been found in Quran and Bible (Jones and Mann, 1963). It is also called as viz., Pyaz, Ullagaddi, Eerulli, Neerulli in vernacular languages. Since, it is an indispensible component of culinary in the Indian kitchen. Therefore, onion is popularly referred as "Queen of the Kitchen". Recently onion is being employed by processing industry to a greater extent for preparing dehydrated onion forms like powder and flakes.

In India, onion is primarily grown in the states of Maharashtra, Karnataka, Gujarat, Odisha, A.P., U.P., Bihar and Madhya Pradesh. In India this crop is cultivated on 1270.4 thousand/ha area with production of 21563.9 thousand metric tonnes and productivity of 17.0 metric tons/ha. Whereas, in Madhya Pradesh crop covers 120.1 thousand ha area and producing 3254.5 thousand metric tonnes (Anonymous, 2017) of onion. Bell (1981) also reported sulphur containing secondary compounds was not only of importance for nutritive value and flavors, but also for resistance against pests and diseases. Sulphur has been recognized as an important nutrient for higher yield and quality of onion bulbs (Lakkineni and Abrol, 1994; Jaggi and Dixit, 1999). Onion is a sulphur loving plant and is required much for proper growth and yield of onion (Kumar and Singh, 1995). Sulphur has been found not only to increase the bulb yield of onion but also improves its quality, especially pungency and flavors (Jaggi

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and Dixit, 1999).

Materials and Methods

Tikamgarh district lies in the Bundelkhand Zone (Agro-climatic Zone- VIII). It is situated in the north-eastern part of Madhya Pradesh. The field experiment was carried out during winter 2019-20 at Research Farm, College of Agriculture, Tikamgarh (M.P.). The meteorological data prevailed during crop season November, 2019 to April, 2020 (Rabi 2019-20) was recorded on (maximum, minimum and mean temperatures, mean relative humidity and weekly rainfall) at the Meteorological Observatory of research Farm, College of Agriculture, Tikamgarh (M.P.). The average minimum temperature (13.5 ^{0}C) maximum temperature (33.6^{0}C), Relative humidity (72.8 %) and rainfall (0.053 mm) were recorded from crop period of 41 th SMW (Standard Mean Week), 08-14 October, 2019 to 17th SMW, 23-30 April, 2020. The soil of experimental plot was studies for their physical and chemical properties and available nutrients levels. The soil was medium black having loamy texture. The soil pH (7.86), organic carbon (0.5%), availability of nutrients like nitrogen, phosphorus and potassium 203, 17.9 and 392 kg/ha were recorded.

The experiment design was used as randomized block design. The treatments consist of four level of sulphur (0, 20, 40 and 60 kg S/ha) replicated trice. Sulphur fertilizer was given as basal and other fertilizers were given in split applications. Different growth parameters were recorded at 30 days interval. Onion var. '*Pusa Red*' (50 days old seedling) was transplanted in field. Well decomposed FYM (at the rate of 10 t/ha) was applied uniformly at the time of field preparation and crop was fertilized with 100:80:80 kg NPK/ha. Observations on Vegetative growth at different interval while yield parameters and bulb yield were taken at harvest stage of onion crop. The crop was harvested on last week of April during both years and yield was recorded after grading.

Results and Discussion

The analysis of variance of onion with respect to different traits for levels of sulphur application in onion revealed that considerable variation exists for all the growth parameter *viz.* plant height, No. of laves plant^{-1}, leaf length, leaf diameter, neck thickness yield attributes bulb length, polar diameter, equatorial diameter and bulb weight. The data presented in Tables 1 indicated significant differences between sulphur levels for plant height at 30th, 60th and 90th day after transplanting (DAT). At 30 DAT stage, the height varied from 24.69 to 31.67 cm in different treatments. At 60 DAT, it ranged between 43.54 to 51.50 cm. Maximum height was recorded at 90 DAT stage, which ranged from 52.78 to 62.62 cm. Plant height for treatment 60 kg S/ha was found maximum at 30, 60 and 90 DAT. Nasreen *et al.* (2005) plant height increased with increase in S rate upto 60 kg/ha and Increasing the levels of sulphur up to 60 kg/ha increased the sulphur uptake throughout the season and also produced the highest bulb yield. Sulphur fertilization significantly affected plant height. Moreover, the lowest values for these variables were recorded under sulphur regime of 0 kg S/ha (control). Jain *et al* (2014) reported that application of sulphur 60 kg/ha significantly increased plant height. Leaf length for treatment 60 kg S/ha was found maximum at 30DAT, 60DAT and 90 DAT. At first stage i.e., 30 DAT, the length varied

Table 1. Effect of sulphur levels on growth attributes of onion

Treatment	Plant height (cm) 90 DAT	Leaf length (cm) 60 DAT	Leaves diameter/ plant (cm)	Neck thickness (cm)	Number of leaves/ plant
Sulphur levels (kg/ha)					
Control (0)	52.78	45.06	0.54	1.42	7.74
20	55.67	47.44	0.63	1.54	8.62
40	60.73	52.66	0.68	1.64	9.13
60	62.62	55.46	0.95	1.88	10.25
SEm±	0.22	0.27	0.03	0.01	0.22
LSD (*P*=0.05)	0.67	0.80	0.10	0.04	0.66

from 18.35 to 23.65 cm in different treatments. At 60 DAT, it ranged between 34.55 cm to 45.31cm. Leaf length ranged from 45.06 cm to 55.46 cm and 90 days stage. Thus, maximum leaf length was noted for 60 kg/ha application of sulphur reported that leaf length increased upto 60 kg S/ha.

There was significant effect of sulphur was recorded on number of leaves. Maximum leaf number is noted for 60kg/ha application of sulphur and every increment in sulphur Increase the leaf number. Similar findings have been reported by Jain *et al*. (2014) and Tripathy *et al.* (2013).

Leaf diameter ranged from 0.54 cm to 0.95 cm in different sulphur treatment and maximum leaf diameter 0.95 cm was recorded for the treatment 60 kg S/ha. Whereas it found least in 0 kg S/ha.

Neck thickness for different treatment was found maximum at 60DAT and neck thickness range between 1.42 to 1.88 cm different doses of sulphur treatment. Neck thickness was found minimum for 0 kg S/ha treatment. Tripathy *et al.,* (2013) reported significant variations among the levels of sulphur application in onion.

Yield and yield attributes

The studies pertaining to yield parameters and yield were conducted on equatorial bulb diameter, polar bulb diameter and bulb yield indicated significant influence of sulphur in onion. Both polar and equatorial diameters play an important role in determining the shape and size of onion bulb. Data on equatorial bulb diameter revealed significant increase with incremental doses of sulphur. The maximum ranged 4.57 to 6.11 cm. Highest equatorial bulb diameter was recorded with application of 60 kg S/ha. Though, it was at par to 40 kg S/ha application, but significantly higher than 20 kg S/ha. These findings have been corroborated by Jain *et al*. (2014). Tripathy *et al.,* (2013) also reported that application of sulphur significantly increased the equatorial diameter. Nagaich *et al.,* (1999) reported that polar diameters increased with sulphur application 60kg S/ha over control plots. At harvest stage diameter, of bulb ranged from 4.31 to 5.99 cm. There was increase in polar bulb diameter with increasing doses of sulphur and highest polar bulb diameter was found with application of 60 kg S/ha. It was significantly superior over other lower doses. Similar findings have been reported by Jain *et al*. (2014). Bulb weight of onion significantly increased with application of sulphur over no application. Highest bulb weight was observed with application of sulphur at the range of 60 kg S/ha. Increase in bulb weight with increasing rates of sulphur was reported by Mishu *et al.,* (2013).

Yield is the main parameter which is considered important to harvest better produce. In this experiment, it is noted that onion yield increased significantly with application sulphur over control plot (without sulphur application). De Souza *et al.,* (2015) reported that onion productivity was 16% lower in no sulphur application plot. It was also noted that levels of sulphur application linearly increased the bulb yield of onion up to 60 kg S/ha which was also observed by Jain *et al*. (2014). Different sulphur levels showed significant impact on the Yield parameter. The maximum diameter of bulb, bulb length, bulb weight and yield/plant were observed with S3 (60kg S/ha) followed by S2 (40kg S/ha), while, the minimum yield parameter were measured with S0 (0kg S/ha). The significantly maximum yield (282.00 q/ha) was obtained from 60 kg S/ha**.** On the basis of recorded data it can be concluded that treatment 60 kg S/ha proved batter to harvest higher yields.

Table 2. Effect of sulphur levels on yield and yield attributes of onion

Treatment	Polar diameter (cm)	Equatorial diameter (cm)	Bulb length (cm)	Average bulb weight (g)	Yield (q/ha)
Sulphur levels (kg/ha)					
Control (0)	4.31	4.57	3.90	69.71	230.81
20	4.71	5.23	4.69	76.18	248.24
40	5.51	5.58	5.38	83.17	261.47
60	5.99	6.11	5.73	91.32	282.00
SEm±	0.06	1.2	0.09	0.31	1.23
LSD (*P*=0.05)	0.19	3.8	0.28	0.93	3.65

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