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EFFECT OF SOIL AND FOLIAR PPLICATIONS OF ZINC AND SULPHUR ON GROWTH, YIELD AND QUALITY OF ONION (ALLIUM CEPA VAR AGGREGATUM L.) CV GNANAMEDU LOCAL

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Abstract:

A field experiment was conducted during 2010 at vegetable unit, Department of Horticulture, Annamalai University, Tamil Nadu. India to find out the effect of application of zinc and sulphor and their different combination on growth, yield, and quality of onion. There were 11 treatment combinations with Zn and S were applied either in the soil and foliar spray. Application of Zn with Sulphur significantly increased the bulb weight (9.27 g), bulb yield (23.99 t/ha). Zinc and Sulphur application significantly influenced the bulb quality and recorded the highest 'A' grade bulbs.

Key Words: Onion, Zinc, Sulphur, Yield & Quality

Introduction:

Onion (*Allium cepa* var aggregatum. L cv. Gnanamedu local) is a versatile food source due to its unique flavor and odor. It adds taste to many dishes in the form of vegetables as well as spice. It's the unique ingredient of the dishes from the richest to the poor man's meal. Onion are rich in powerful sulphur containing compounds that are responsible for pungent odors, and for many of health-promoting effects.. India consumes on an average, 40 lakh tonnes of onion a year and the projected imports of around 13,000 tonnes partly meet out from the countries like Iran, Oman, and Dubai (Anon., 2010) So, to meet the growing demand, concentrated efforts are needed to produce sufficient quantity and of high quality onions. With no scope for expansion in area under onion cultivation, future growth has to come from increase in output by finding the ways and means to enhance the productivity of onion through suitable agro-technologies that are within the reach of Indian farmers. One of the options is by using balanced nutrition and the supply of macro and micronutrients through the combination of both organic and inorganic sources. Information regarding interactive effects of mineral nutrients, phytohormones and other bio-regulators on physiological processes, yield and quality of onion has not yet been established. Therefore, the present investigation was undertaken to find out the effect of zinc (Zn) and sulphur application from difrent sources on growth, yield and quality of onion.

Materials and Method:

The field experiments were conducted during 2010 at vegetable unit, Department of Horticulture, Annamalai University. The details of experimental soils were clay loam, the pH is 6.7. The established onion seedlings were collected from the farmers field at Gnanamedu, Cuddalore District. The experiments were conducted during *khari* season. It was laid out in a randomized block design with three replications. There were altogether 11 treatment combinations with Zn and S from difrent sources applied as soil and foliar methods. Soil application of Zn and S was done at 15 days of transplanting (DAT), while foliar applications were given at 30, 45, and 60 of DAP.

Healthy seedlings of 45 days' old were transplanted in the main field after removing upper one third portions of leaves to reduce the loss of water through transpiration. Particular Rate of application Mode of application Zn 2 kg ha^{-1} Soil application Foliar application 1g/l Foliar application .RDF 60 kg N, 60 kg P_2O_5 and 30 kg K_2O basal application. Zinc was applied as $ZnSO_4$. The 50% N was applied as basal and remaining in two equal splits at an interval of 30 and 45 days after transplanting. Proper care for weeding, intercultural operations, and plant protection measures were taken from transplanting to harvesting. Observations on growth, bulb yield and quality were made from the selected tagged 5 plants for each treatment. The parameters on onion bulbs were recorded after harvesting and curing. The onion bulbs were harvested when the leaves turned yellow and the bulbs were cured in the field for a week. The harvested bulbs were cleaned and tops were removed carefully. The bulbs were cured again under shade for 3-4 days. The yield and quality parameters were recorded from randomly selected 5 bulbs of each plot. Statistical analysis was done by using standard techniques (Panse and Sukhatme, 1975).

Results and Discussion:

The data on the yield and quality parameters as influenced by various treatments with Zinc and Sulphur their mode of applications presented in Table 1. The results revealed that the effect of zinc and sulphur along with organic manures and RDF, significantly increased bulb weight, dry matter content in bulb, and bulb yield of experimentation. Application of Zn and So_4 kg ha^{-1} basal application produced significantly higher bulb weight

(11.16g followed by Zn with sulphur 40 kg ha^{-1}over control. However, dry matter content was higher with the combined application of Zn with sulphur 50 kg ha^{-1} followed by comparable content with. The bulb yield (22.86 t/ha) was significantly superior to the application of Zn with sulphur 50 kg ha^{-1} followed by Zn+ sulphur 40 kg ha^{-1} with cow dung.

The increase in bulb weight might be due to improved growth and yield attributes as a result of positive influence of Zn and S. Similar findings were also recorded by Channagouderand and Janawade. 2006. The integrated nutrient management showed superior performance towards yield improvements Yang Liv, and Wang. 2005. The treatments of $Znso_4$, along with So_4 might be responsible for increasing the chlorophyll content and thereby photosynthetic rate, which usually cause increase in the yield. Manipulation of source (leaf) and sink (bulb) relationship through the above treatments may be the principal reason for yield improvement.

The bulbs were graded into three categories based on diameter viz., 'A' grade (greater than 4.5 cm), 'B' grade (2.5 to 3.5 cm), and C grade (lesser than 2.5 cm) The significantly higher value of 'A' grade bulbs was recorded with the application of Zn with sulphor compared to control .However, the lowest percentage of poor quality 'C' grade bulbs were obtained with the application of Zn foliar spray with RDF compared to control which recorded the highest number of poor quality 'C' grade bulbs The medium 'B' grade bulbs were observed with the application of Zn with S whereas, the highest result followed by control (36.1%). Ascorbic acid content of the onion bulbs recorded with the application of Zn and S were significantly higher than control (14.18%). Similar findings were also recorded by Abrol and J. L. Katyal. (1990). The improvement in Ascorbic acid content in treated bulbs due to micronutrients might be attributed to enhance metabolic process involved in biosynthesis of total soluble solids such as carbohydrates, organic acid, amino acids and other inorganic constituents. Meena and Singh 1989). The Zn and S when act in combination, they have profound effect of carbohydrates, starch, sugars, fructose, proteins, etc. The enhancement in all such bio-chemical constituents had caused an increase in TSS and dry matter. Both the bulb quality parameters are important in processing, storage and export. Thus, it can be concluded that the basal application Zn and Sulphur had remarkable effects and increased bulb weight, bulb yield, and the 'A' grade bulbs of onion in the experimentation.

Table 1: Effect of Soil and Foliar Pplications of Zinc and Sulphur on Growth, Yield and Quality of Onion (*Allium cepa* var aggregatum L.) cv Gnanamedu local

Treatment details	Plant height (cm)	Number of leaves $plant^{-1}$	Number of tillers	Chlorophyll content	Dry matter production
T_1- Control	19.58	5.56	2.56	0.62	1168.87
T_2-Zn 6 kg ha^{-1}	32.46		5.42	1.25	
T_3-Zn 12kg ha^{-1}	38.71		6.25	1.58	
T_4-Sulphur 40 kg ha^{-1}	34.69		5.74	1.35	
T_5- Sulphur 45 kg ha^{-1}	38.70		6.00	1.47	
T_6-Sulphur 40 kg ha+ Zn 6 kg ha^{-1}	40.66		6.50	1.69	
T_7- Sulphur 40 kg ha+ Zn 6 kg ha^{-1}	52.34	9.35	8.11	2.33	
T_8- Sulphur 45 kg ha+ Zn 6 kg ha^{-1}	42.60	5.	6.75	1.80	
T_9- Sulphur 45 kg ha+ Zn 12 kg ha^{-1}	54.18	18.10	8.36	2.44	4973.28
T_{10}- Sulphur 40 kg ha+ Zn 1%	44.50	6.33	7.01	1.90	
T_{11}- Sulphur 40 kg ha+ 2%	48.51	7.84	7.58	2.10	
T_{12}- Sulphur 45 kg ha+ Zn 1%	46.53	7.08	7.30	2.00	
T_{13}- Sulphur 45 kg ha+ Zn 2%	50.48	8.60	7.85	2.21	
S.ED	0.92	0.36	0.12	0.045	
CD	1.84	0.72	0.24	0.09	

Individual bulb weight	Number of bulb $plant^{-1}$	Yield $plot^{-1}$	Bulb yield ha^{-1}	Ascorbic acid content (mg g^{-1})	Sulphur content (g)	Pyruvic acid (µ mol mg^{-1})
2.18	3.64	8.21	4.99	5.53	0.39	1.32
6.09	6.52	10.51	11.00	8.36	0.56	2.13
7.66	8.07	11.92	14.60	10.59	0.91	2.52
6.63	7.17	11.00	12.17	9.74	0.84	2.26
7.14	7.64	11.47	13.35	10.18	0.88	2.43
8.19	8.48	12.38	15.81	11.01	0.95	2.61
11.16	8.89	15.05	22.86	13.74	1.18	3.20
8.68	6.91	12.85	17.02	11.44	0.98	2.71
11.65	9.27	15.49	23.99	14.18	1.21	3.29
9.17	7.35	13.28	18.20	11.88	1.01	2.80
10.15	8.12	14.17	20.55	12.76	1.10	3.00
9.65	7.73	13.72	19.38	12.30	1.05	2.90
10.66	8.51	14.61	21.70	13.27	1.14	3.09
0.23	0.18	0.20	0.56	0.19	0.01	0.04
0.47	0.36	0.41	1.13	0.38	0.02	0.08

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