Madras Agric. J. 79 (8) : 423 - 426 August 1992

https://doi.org/10.29321/MAJ.10.A01772



# EFFECT OF APPLICATION OF MICRONUTRIENTS ON YIELD AND QUALITY OF ONION (*Allium cepa. L*)[1]

A. PALANIVEL[2] and G. RAMANATHAN

## ABSTRACT

The effect of soil and foliar application of micronutrients (Mn, Zn and Fe) on two varieties (MDU-1 and CO-3) of onion in black and red soil were studied by a pot experiment. The beneficial effect of soil application of $MnSO_4$ was evidenced, both in yield and quality of onion. Between the two varieties tested, MDU-1 fared better than CO-3 in both the soil types.

Onion is widely cultivated in soils differ much in their characteristics (such as the black, red and alluvial soils). Though, for increasing onion yields, various doses of nitrogen, phosphorus and potash were suggested (Kunkel, 1947; Furguson and Faulker, 1954; Singh and Singh, 1969), information on the performance of onion (small), the relative yield levels in different soil groups and effect of micronutrients on the bulb yield and quality characters are lacking. Sporodic work has been carried out elsewhere to study the effect of micronutrients on bulb yield of onion, (Tiba bisew, 1972; Jagodin, 1975, Katara, *et al.*, 1971 and Sinetskii 1974). With a view to exploring the possibility of increasing onion yield through micronutrients the present study was taken up.

## MATERILAS AND METHODS

The pot experiments involved two soils (red and black) two onion varieties (CO-3, MDU-1) and soil and foliar application of three micronutrients ($MnSO_4$, $ZnSO_4$ and $FeSO_4$) was carried out.

The soils were potted @ 10 kg/pot in polythene lined earthern pots and fertilized basally with NPK @ 60 30 30 kg/ha. Soil application of respective micronutrient ($MnSO_4$ @ 25 kg $ha^{-1}$, $ZnSO_4$ @ 25 kg $ha^{-1}$ and $FeSO_4$ @ 100 kg $ha^{-1}$) made basally and foliar application of 1% $MnSO_4$, 0.5% $ZnSO_4$ and 1.5% $FeSO_4$ made at 30, 40 and 50 DAP. Bulbs planted @ 4 per pot. The experiment was conducted in a randomised block design with four replications. The initial soil characteristics are presented in Table - 1. Data were collected on yield, total sugars and pyruvic acid content. The methods suggested by Yoshida et al. (1976) and Hort Fisher (1971) were employed for quality studies.

---

1 Part of M.Sc. (ag.) thesis submitted by the senior author to the Tamil Nadu Agrl. University

2 & 3. Directorate of Soil and Crop Management Studies, TNAU, Coimbatore - 641 003

TABLE 1 : Details of initial soil analysis

| | Black Soil | Red Soil |
|---|---|---|
| Available nitrogen (ppm) | 84 | 65 |
| Available phosphorus (ppm) | 6 | 3 |
| Available potassium (ppm) | 98 | 110 |
| Available calcium (ppm) | 3890 | 2090 |
| Available iron (ppm) | 1.45 | 1.85 |
| Available manganese (ppm) | 1.56 | 2.20 |
| Available copper (ppm) | 0.80 | 0.92 |
| Available zinc (ppm) | 0.94 | 0.68 |
| Organic carbon (%) | 0.62 | 0.45 |
| Soil reaction (pH) | 7.7 | 7.5 |
| Electrical conductivity ($dsm^{-1}$) | 0.82 | 0.53 |
| Cation exchange capacity me/100 g of soil | 34.9 | 27.8 |

## RESULT AND DISCUSSION

The data on yield of onion as affected by treatments are presented in Table 2.

The mean bulb yield ranged between 146 to 152 g/pot. While the effect due to varieties was non significant, the effect due to soils and micronutrient application showed significant difference.The beneficial effects of application $MnSO_4$ and $FeSO_4$ either a soil or foliar application was well evidenced. Similar were the findings by Pandian (1980) and Shahi *et al.* (1976). Between soil and foliar methods, the former had a slight edge over the later. Among the two soils, the growth and yield of onion was better in black soil (152.5 g/pot) than red soil (146 g/pot).

The interaction effects between variety x treatments and soil x treatment revealed significance. By and large, soil application of $MnSO_4$ @ $kg/ha^{-1}$ recorded significantly higher yields of both the varieties, which were, however, on par with bulb yield due to soil application of $FeSO_4$ @ 100 kg/ha. It was therefore, clear from the results that application of $MnSO_4$@ 25 kg/ha appeared to have a distinct favourable effect than the other treatments and this may be due to the correction of Mn deficiency and thereby increase in yield and this is an agreement with other worker (Kroetz el al., 1978).

## QUALITY CHARACTERS

The quality characters were sought to be expressed in terms of total sugar and pyruvic acid content of the bulb which is also taken as a measure of

**TABLE 2 : Bulb yield of onion g/pot**

| Treatments | Red Soil | | | Black Soil | | |
|---|---|---|---|---|---|---|
| | C03 | MDU1 | Mean | C03 | MDU1 | Mean |
| $T_1$ Control | 142 | 144 | 143 | 149 | 149 | 149 |
| $T_2$ $MnSO_4$ @ 25 kg/$ha^{-1}$ as basal | 146 | 146 | 146 | 159 | 160 | 159 |
| $T_3$ 1% $MnSO_4$ foliar spray at 30th, 40th & 50th day | 142 | 147 | 144 | 151 | 153 | 152 |
| $T_4$ $ZnSO_4$ @ kg $ha^{-1}$ as basal | 148 | 144 | 146 | 151 | 148 | 149 |
| $T_5$ 0.5% $ZnSO_4$ foliar spray at 30th, 40th & 50th day | 148 | 145 | 146 | 148 | 146 | 147 |
| $T_6$ $FeSO_4$ @ 100 Kg $ha^{-1}$ as basal | 146 | 148 | 147 | 157 | 157 | 157 |
| $T_7$ 1.5% $FeSO_4$ foliar spray at 30th, 50th day | 40th | 148 | 146 | 147 | 153 | 152 |
| mean | 145 | 146 | | 152 | 152 | |
| CD = (P = 0.05) | S 0.73 | V NS | T 1.38 | SxV 1.04 | SxT 1.95 | VxT 1.95 |

**TABLE 3 : Quality characters of Onion**

| Treatments | Total sugar content % | | | | Pyruvic acid content u $moles g^{-1}$ | | | |
|---|---|---|---|---|---|---|---|---|
| | Red Soil | | Black Soil | | Red Soil | | Black Soil | |
| | CO-3 | MDU-1 | CO-3 | MDU-1 | CO-3 | MDU-1 | CO-3 | MDU-1 |
| $T_1$ Control | 5.04 | 5.06 | 5.07 | 5.09 | 1.30 | 1.40 | 1.50 | 1.50 |
| $T_2$ $MnSO_4$ @ 25 kg/$ha^{-1}$ as basal | 5.32 | 5.40 | 5.36 | 5.35 | 2.30 | 2.80 | 2.50 | 2.90 |
| $T_3$ 1% $MnSO_4$ foliar spray at 30th, 40th & 50th day | 5.18 | 5.34 | 5.24 | 5.27 | 2.00 | 2.20 | 2.10 | 2.60 |
| $T_4$ $ZnSO_4$ @ kg $ha^{-1}$ as basal | 5.13 | 5.14 | 5.18 | 5.30 | 2.00 | 2.40 | 2.10 | 2.30 |
| $T_5$ 0.5% $ZnSO_4$ foliar spray at 30th, 40th & 50th day | 5.10 | 5.09 | 5.14 | 5.10 | 1.80 | 2.10 | 1.75 | 2.00 |
| $T_6$ $FeSO_4$ @ 100 Kg $ha^{-1}$ as basal | 5.27 | 5.31 | 5.35 | 5.33 | 2.10 | 2.40 | 2.30 | 2.60 |
| $T_7$ 1.5% $FeSO_4$ foliar spray at 30th, 40th & 50th day | 5.08 | 5.21 | 5.22 | 5.24 | 1.90 | 2.10 | 2.00 | 2.10 |
| CD (P = 0.05) | S 0.02 | V 0.02 | T 0.03 | S 0.06 | V 0.06 | T 0.12 | | |
| | SxV 0.02 | SxT 0.05 | VxT 0.05 | SxV NS | SxT 0.17 | VxT 0.17 | | |

pungency (Table 3). The data showed the superior effect of soil application of $MnSO_4$ followed by the soil application of $FeSO_4$.

It follows the foregoing that the black soils are more ideally suited for onion crop and among the two varieties tested MDU-1 performed better than Co-3. Irrespective of the soil type and variety soil application of micronutrients $MnSO_4$ and$FeSO_4$ proved to be beneficial. Application of $MnSO_4$ @25 Kg $ha^{-1}$ is recommended for the yield and quality improvement of onion.

## REFERENCES

HART, A.M. and H.J. FISHER. 1971. Vegetable and vegetableproduces. **Modern Food Analysis.** 416 438.

JAGODIN, B.A. 1975. The effect of micronutrients on the germination and the growth of some crops. Hort. Abstr. 11 : 257.

FURGUSON, A.C. and FAULKER, H. 1954. The effect of certain chemical fertilizer combinations on yield, grade and storage, quality of sweet spanish onions. Bull. 52, Colorado agric. Sta.

KATARE, D.S., KASHYAP, R.P. and SINGH, M.P. 1971. Effect ofpotash and micronutrients sprays (Zn, Mn and Cu) on onion. **Fertilizer News. 16** : 5152.

KROETZ, M.C., SAHMIDT, W.H., BEVERLEN, J.E., and RYDER, G.L.1978. Prevent manganese deficiency in soybeans. Fld. Crop. Abstr.31 : 3605.

KUNKEL, R. 1947. Effect of various levels of N, $P_2O_5$ and $K_2O$ on yield and keeping quality of onion. Proc.Amer. Soc. Hort. Sci. 50 : 361-7.

PANDIAN, P.1980. Response of soybean varieties to application of Mn, Zn and Mo. M.Sc.(Ag.) dissertation, Tamil Nadu Agrl. University.

SINETSKII, R. 1974. The technique and effectiveness of treating onion seeds with minor elements in the Forenett steppezone of the urkannian (USSR). Hort. Abstr. 11 : 550553.

SHAHI, M.N., KHIND, K.S. and GILL, P.S. 1976. Iron chlorosisin rice (Oryza sativa L.) Plant and Soil. 44 : 23132.

SINGH, M.P. and SINGH, R. 1969. Response of onion to differential application. **Ind. J. Agric. Sci.39** : 102628.

TIBABISEW, N.K. 1972. Effect of micro elements on the yield of onions grown as an annual crop with irrigation. From Referatiuny Zhurnal. 55 : 553. Hort. Abstr. 42 : 473 - 475.

YOSHIDA, S., FORNO, D.A., COCK, J.H.and GOMEZ, K.A. 1976. Laboratory manual for physiological studies of rice. IRRI Publication, **Determination of sugar and starch in plant tissue,Chap 11** : 46-49.