https://doi.org/10.29321/MAJ.10.A04062

Studies on the effect of Micro-Nutrients on the yield of Potato

by

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Introduction : On the Nilgiris though the potato crop receives higher doses of the major nutrients, viz., Nitrogen, Phosphorus and Potash (80 N + 200 P_2O_5 + 100 K_2O), per acre, the average yield is comparatively low. In view of the emphasis of recent studies on the importance of micro-nutrients in plant growth, it was found necessary to ascertain whether the low yield is due to lack of certain micro-nutrients.

Review of Literature : Though the importance of micro-nutrients has definitely been proved, the results of field trials vary due to the fact that their requirement in very small quantity is sufficient and their presence in different soils vary. Malenev (1954) reports increase in yield of tubers due to treatment with manganese and copper from early varieties. The report of Chisholm and Maceachern (1954) and Johnson *et al* (1956) indicate the lack of response to additional application of micro-nutrients. Vlasyuk and Bakmet'eva (1958) report from their studies that spraying the leaves with 0·01 to 0·25% solution of salts of copper, zinc, manganese and boron increased the tuber yield, the effect of copper and manganese being the highest.

Materials and Methods : As the previous trials at this Station with copper and zinc individually were not found to be beneficial, different combinations, of the micro-nutrients, copper, zinc, manganese, boron and molybdenum were tried. Two modes of applications namely (1) To soil along with the fertilizer mixture below the seed in the furrows (i. e., the fertilizer mixture and the micro-nutrients were applied to furrows and covered over with a thin layer of soil over which the seed tubers were placed and covered) and (2) Foliar application in a single spray about 35 days after sprouting were studied. The details of the treatments and the dosage of the micro-nutrients studied in the trial are given below :—

Details of combinations	Dosage for soil application		Dosage for foliar application
		per acre	per acre
1. Control			
2. Cu, Zn, B, Mn and Mo	Copper sulphate	20 lb.	5 lb.
3. Cu, Zn, B, and Mn	Zinc sulphate	10 lb.	5 lb.
4. Cu, Zn, B, and Mo	Borax	40 lb.	10 lb.
5. Cu, Zn, Mn and Mo	Manganese sulphate	10 lb.	5 lb.
6. Cu, B, Mn and Mo	Sodium molybdate	5 lb.	2 lb.
7. Zn, B, Mn and Mo			

There were two series in the trial for the soil and foliar applications and each series was laid out in randomised replicated plots with seven treatments replicated 6 times. The popular variety Great Scot was used in the trial and all the treatments received a basal dressing of 80 pounds N, 200 pounds P_2O_5 and 100 pounds K_2O supplied by 200 pounds Ammonium sulphate, 500 pounds Groundnut cake, 350 pounds of Bone meal and 672 pounds of Superphosphate and 224 pounds of Potassium sulphate per acre.

Presentation of Data: The trial was conducted during the autumn season of 1957—'58 and the summer and autumn seasons of 1958—'59. The summary of the results are given below:

SUMMARY OF RESULTS

Soil application.

Treatments	1	2	3	4	5	6	7	'Z' test satisfied or not	Critical difference	Standard Error
* *Autumn season 1957—'58*										
Acre yield in lb. ...	5,600	5,733	5,466	5,466	5,466	6,000	6,133	No	...	863·6
Percentage over Control ...	100·0	102·4	97·6	97·6	97·6	107·1	109·5	...	...	15·4
* *Note:* The crop suffered due to severe incidence of brown rot hence the results should be viewed with caution.										
Summer crop 1958—'59										
Acre yield in lb. ...	17,467	13,033	12,200	12,133	16,833	13,133	12,467	Yes	1,495	
Percentage over Control ...	100·0	74·6	69·8	69·5	96·4	75·1	71·4	...	8·5	
Conclusion: $\overline{1, 5,}$ 6, 2, 7, 3, 4										
Autumn crop 1958—59										
Acre yield in lb. ...	13,867	6,500	7,700	7,100	13,300	7,567	7,433	Yes	1,572	
Percentage over Control ...	100·0	46·9	55·5	51·2	95·9	54·6	53·6	...	11·3	
Conclusion: $\overline{1, 5,}$ 3, 6, 7, 4, 2										

Foliar application.

Treatments		1	2	3	4	5	6	7	'Z' test satisfied or not	Standard Error
* *Autumn crop 1957—'58*										
Acre yield in lb.	...	7,066	7,066	6,933	6,666	6,000	5,866	7,466	No	873·6
Percentage over Control	...	100·0	100·0	98·1	94·3	84·3	83·0	105·7	...	12·3
Summer crop 1958—'59										
Acre yield in lb.	...	13,000	14,067	14,267	14,267	12,933	13,700	14,667	No	1818·4
Percentage over Control	...	100·0	108·4	109·7	109·7	99·5	105·4	112·8	...	14·0
Autumn crop 1958—'59										
Acre yield in lb.	...	12,467	11,933	11,533	11,667	11,500	12,500	12,433	No	710·8
Percentage over Control	...	100·0	95·7	92·5	93·6	92·2	100·3	99·7	...	5·8

* The crop suffered due to severe incidence of Brown rot and hence the results should be viewed with caution.

The results of the three seasons concur in that there is no beneficial effect due to the additional application of micro-nutrients irrespective of the mode of application.

Discussion : The additional application of micro-nutrients either to soil or as foliar spray had little effect in increasing the yield of tubers. This lack of response may be due to the presence of certain micro-nutrients in the fertiliser ingredients like superphosphate used in the potato fertilizer mixture.

Besides, when the micro-nutrient mixture was applied to soil (under the tubers at sowing) it had some deleterious effect as reflected by the significantly low yield. This deleterious effect may be due to the presence of boron, as the treatments receiving boron as a component in the micro-nutrient mixture showed the deleterious

effect. In the previous trials at this station though the application of graded doses upto 30 lb. per acre of borax did not produce significant yield increase, there was no deleterious effect. Thus the delayed sprouting and stunted growth of the plants recorded may be due to the effect of excess boron as the dosage adopted in this trial was 40 lb. of borax per acre.

Conclusion : The trials conducted at the Agricultural Research Station, Nanjanad reveal that there is no response in yield due to additional application of micro-nutrients. Injuries possibly due to excess boron on potato crop has been recorded when soil application of 40 lb. of borax per acre was done.

Acknowledgement : The authors express their thanks to the Superintendent, Agricultural Research Station, Nanjanad, for his help in the conduct of this trial.

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