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Effect of Fertilizers on Availability of Soil Manganese in Two Soil Types of Madhya Pradesh

by

S. K. GUPTA [1] and Y. B. RANGNEKAR [2]

Introduction: Among the various trace elements, Manganese (Mn) has received considerable attention owing to its function as a vital nutrient and its important biological role in plant physiology (Russel, 1953; Rangnekar, 1945). Heintze and Mann (1946) noticed decreased available Mn content due to application of lime to acidic soils. A large part of soil Mn in alkaline soils was observed to be in the unavailable form by Dion and Mann (1946) and Mattson *et al* (1948). The different fertilizing materials are having different effects on pH and other properties of soil, which leads changes in the status of available nutrients, specifically in case of Mn. Charles and Sherman (1948) found the effect of sulphur in increasing the available Mn content of soil. Venkatesvarlu (1964) found a significant increase in the Mn content of rice when he added extra sulphur as sulphate. Nitrogen and sulphur additions were shown to beneficially affect its availability to arable crops (Mulder *et al* 1952, Tisdale *et al* 1949).

Materials and Methods: The experiments were conducted in laboratory with surface soil samples (0–23 cm) of medium black and alluvial soil, collected from Agricultural College Farm, Indore and from Agricultural Research Institute Farm, Gwalior, respectively. The bulk soil samples were ground, passed through 2 mm sieve and four hundred grams of soil from each type were filled in individual earthern pots. Sulphur was mixed with soils before filling the pots at the rate of 1000 and 1500 pounds per acre. Ammonium sulphate and Urea were applied at the rate of 40 and 80 pounds of nitrogen per acre basis in solution form. Moisture was maintained at 20% level every day in all cases. There were four replications of each treatment. The pots were kept at room temperature. The samples were drawn at intervals of 30, 60 and 90 days, for the estimation of available Mn and pH.

Soil reaction was determined with spectrophotometer (UNICAM sp. 600) as per procedure of Piper (1950).

Results and Discussion: Results showing the available Mn content and pH changes due to application of fertilizers of medium black soil and alluvial soil, are furnished in Table.

1. Lecturer in Chemistry, College of Agriculture, J. N. Agricultural University, Jabalpur (M.P.)
2. University Professor in Bio-chemistry, Veterinary College, J. N. Agricultural University, MHOW - Campus (M. P.)

TABLE. *Effect of Fertilizers on the available manganese and pH (Mean of 4 replications and Manganese in ppm)*

Treatments	Period					
	30 days		60 days		90 days	
	Mn	pH	Mn	pH	Mn	pH
			Medium black soil			
Control	2.14	7.5	2.32	7.5	2.67	7.5
Sulphur I dose	8.21	7.4	9.28	7.3	10.18	7.1
Sulphur II dose	10.89	7.4	10.89	7.2	11.25	7.1
S.E	0.40	0.04	0.316	0.04	0.42	0.47
C.D at 5%	0.91	0.09	0.71	0.09	0.95	0.10
Amm. sulphate I dose	6.61	7.5	6.96	7.4	7.14	7.41
Amm. sulphate II dose	7.86	7.5	7.85	7.3	8.21	7.3
S.E	0.43	0.035	0.46	0.02	0.40	0.04
C.D at 5%	0.99	0.07	1.04	0.06	0.91	0.09
Urea I dose	3.21	7.5	5.53	7.5	7.14	7.3
Urea II dose	5.00	7.5	6.42	7.4	8.39	7.2
S.E	0.65	0.061	0.39	0.02	0.39	0.033
C.D at 5%	1.26	0.13	0.89	0.05	0.89	0.07
			Alluvial soil			
Control	5.89	7.3	6.25	7.3	6.25	7.2
Sulphur I dose	9.10	7.2	10.89	7.2	15.35	7.2
Sulphur II dose	10.89	7.2	11.79	7.2	16.96	7.1
S.E	0.25	0.02	0.42	0.02	0.63	0.01
C.D at 5%	0.57	0.05	0.97	0.05	0.14	0.03
Amm. sulphate I dose	8.57	7.2	8.92	7.2	9.10	7.2
Amm. sulphate II dose	8.75	7.2	10.18	7.2	10.71	7.2
S.E	0.99	0.02	0.42	0.02	0.39	0.02
C.D at 5%	2.25	0.05	0.97	0.04	0.89	0.04
Urea I dose	6.60	7.3	7.14	7.2	7.56	7.2
Urea II dose	7.32	7.2	7.32	7.2	8.75	7.1
S.E	0.42	0.02	0.39	0.02	0.26	0.02
C.D at 5%	0.99	0.12	0.88	0.05	0.59	0.04

Effect of sulphur: Sulphur showed significant increase of available Mn content in medium black soil at both levels. In case of alluvial soil, the higher dose of sulphur did not bring about further significant increase and this indicates that there was no dose effect in case of alluvial soil. Sulphur

also caused a significant fall of pH but was found to be of non-significance in both the soil types. The increase of available Mn content was greater in black soil than in alluvial soil. Waksman (1927) and Conner (1928) experimentally confirmed that application of sulphur gets oxidised to sulphuric acid, through bacterial action which causes the lowering of pH. This decrease in pH causes reduction of higher oxides of Mn. Charles and Sherman (1948) found an increase of 8.4 ppm Mn over control, with the application of one ton of sulphur per acre.

Ammonium sulphate: Available Mn content increases significantly in all cases and in both soils. The higher dose increased the available Mn content after 60 days period in alluvial and after 30 days period in black soil, respectively.

Fall of pH was significant for all periods, in case of alluvial soil and after 60 days period in black soil, higher dose did not cause further significant change in pH in both soil types. When ammonium sulphate is applied to the soil, the final effect is to form equivalent amount of calcium sulphate, which is leached through the soil, leaving an acidic effect (Russel, 1953). This is to cause the reduction, as per Conner (1932), of higher oxides of Mn to the divalent form, thus increasing its availability.

Effect of urea: Application of urea gave significant increase of available Mn in both soil types. In case of alluvial soil, the effect was only significant after 90 days while the black soil showed significant increase for all periods. In alluvial soil, the fall of pH was significant after 90 days, while in black soil the significant decrease was observed after 60 days. Conner (1932) and Millikan (1950) have concluded the residual effect of urea is acidic. It is known that urea applied to the soil is finally converted to nitric acid and then to calcium nitrate, which brings about the decrease of pH. Thus it seems that this decrease in soil pH causes reduction of higher oxides of manganese to increase its availabillty.

Summary: Effect of three different fertilizers *i.e.*, ammonium sulphate, urea and sulphur applied at the rate of two levels (40 and 80 lb N and 1000 and 1500 lb per acre respectively) on the availability of Mn in medium black alluvial soil types of Madya Pradesh have been studied. The availabitity of Mn content were found to be highest after 90 days analysis in both the soils due to application of sulphur followed by ammonium sulphate and urea.

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Panicle Studies in *Indica* and *Japonica* Rice Varieties

by

S. SIVASUBRAMANIAM[1], K. M. PALANISWAMY[2] and T. B. RANGANATHAN[3]

Introduction : The formation of earhead marks the shift from vegetative to reproductive phase and the stored food materials is apportioned between its constituents namely number of grains, number of chaff, grain weight and panicle length. Study of these characters in rice crop helps the breeders in the evolution of strains having high yield potential. Ramiah (1937) has stated that the number of grains found in an earhead is a varietal character and the arrangements of spikelets also vary between varieties. Tin U (1936) observed variation in panicle characters within a variety and grain weight in the same panicle. Ramiah and Parthasarathy (1933) have found that the lower portions of the earheads bear a high proportion of empty grains. Richharia *et al* (1963) emphasised the importance of panicle length and density of grains in the selection of high yielding varieties. Hence a study of earhead

1. Assistant in Paddy, 2. Statistical Officer, Rice Scheme and 3. Assistant in Paddy, Agricultural College and Research Institute, Coimbatore-3.