

Status of available sulphur and micronutrients in soils of Unnao district of Uttar Pradesh

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In recent years, adoption of high yielding varieties and use of high analysis NPK fertilizers led to decline in the status of sulphur and micronutrients in soil to below normal at which productivity of crops can not be sustained. Inventory of available S and micro-nutrients status of the soil helps in demarcating areas where application P particular nutrient is needed for profitable crop production since, no systematic information is yet available on the status of sulphur and micronutrients in soils of Unnao district of Uttar Pradesh. Therefore, present investigation was undertaken to delineate the status of sulphur and micronutrients (Fe, Mn, Cu, Zn and B) in soils of Unnao district of Uttar Pradesh.

GPS based 208 surface soil samples (0-15 cm) were collected covering all block of the district Unnao, of Uttar Pradesh during October and November 2013. The available micronutrient cations (Zn, Cu, Fe, and Mn) were determined

by extracting soil samples with DTPA (Lindsay and Norvell1978) using atomic absorption spectrophotometer (model: AAS 4141). The hot water soluble boron was estimated colorimetrically using Azomethine-H method. The available sulphur in soils was extracted with 0.15% CaCl₂ and determined turbidimetric method (Chesnin and Yein 1951).

The available sulphur content in the soils ranged from 2.0 to 30.6 mg kg⁻¹ with a mean value of 14.1 mg kg⁻¹ Table 1. The available sulphur deficiency was observed in each block of the district Unnao. The sulphur deficiency was found to the extent of 35.6 % with nutrient index value of 1.73. The sulphur deficiency might be due to intensive cropping, limited use of organic manure and no use of sulphur containing fertilizer by the farmers. Similar results were reported by Dixit (2014) in Lalitpur soils. Singh (2015) and Raj Kanwar *et al.* (2016) reported similar results.

Table1: GPS Based available S and micronutrients (mg kg⁻¹) in soils of Unnao

Blocks Name	Sulphur	Boron
Sikandarpur Karan (13)	6.9-22.0(13.3)	0.25-2.60(1.13)
Safipur (13)	7.8-28.0(14.5)	0.47-2.35(0.99)
Fatehpur Chaurasi (13)	6.0-24.0(14.7)	0.30-3.50(1.40)
Bangarmau (13)	6.0-28.0(13.7)	0.25-1.49(0.84)
Ganj Moradabad (13)	5.3-28.9(14.4)	0.18-3.85(1.17)
Auras (13)	7.1-28.6(16.0)	0.25-5.30(1.60)
Asoha (13)	5.3-26.4(13.4)	0.28-4.05(1.52)
Purwa (13)	3.6-29.2(12.2)	0.35-5.35(1.87)
Nawabganj (13)	5.0-25.0(13.6)	0.39-7.15(2.10)
Bichia (13)	8.0-26.5(16.5)	0.49-6.80(1.68)
Bighapur (13)	6.0-25.0(14.1)	0.17-3.50(1.29)
Hasanganj (13)	5.6-30.6(16.2)	0.34-4.50(1.47)
Miyanganj (13)	7.0-27.3(14.9)	0.32-2.10(0.98)
Hilauli (13)	2.0-26.3(13.1)	0.39-4.08(1.75)
Sumerpur (13)	8.0-27.3(14.9)	0.28-7.30(2.39)
Critical Limit (mg kg ⁻¹)	10	0.5

The mean values of hot water soluble boron content in soils of most of the block of Unnao district was above the critical limit (0.5 ppm). Highest (2.39 mg kg⁻¹) and lowest (0.98 mg kg⁻¹) amounts of hot water soluble boron content were recorded in Sumerpur and Miyanganj, respectively. Similar results were reported by Mishra *et al.* (2016). The micronutrient like Zn, Cu, Fe, and Mn in these soils ranged from 0.21-

3.80, 0.10-9.20, 3.0-77.8 and 2.4 - 62.2 mg kg⁻¹, respectively with their corresponding mean values of 1.04, 1.19, 14.4, 16.2 mg kg⁻¹. The nutrient indexes of these micronutrients were 1.85, 2.47, 2.44 and 2.45 for Zn, Cu, Fe, Mn, respectively. Comparing critical limits of nutrient index as 1.5, none of the nutrients in question are deficient in the soils of district Unnao (Table 2).

Table 2: Status of micronutrients (mg kg⁻¹) in soils of Unnao

Blocks Name	Zinc	Copper	Iron	Manganese
SikandarpurSirausi (13)	0.42-1.45(0.96)	0.19-9.20(1.82)	3.4-36.5(12.2)	3.3-34.9(9.2)
Sikandarpur Karan (13)	0.45-3.80(1.52)	0.11-5.15(1.69)	3.0-77.8(31.4)	3.2-42.9(24.1)
Safipur (13)	0.21-2.30(0.90)	0.18-2.65(0.89)	4.6-42.1(13.6)	3.1-23.4(10.0)
Fatehpur Chaurasi (13)	0.30-3.60(1.37)	0.10-6.32(1.98)	4.2-55.5(16.2)	3.6-41.8(14.5)
Bangarmau (13)	0.41-3.22(1.03)	0.16-0.80(0.51)	4.1-16.6(8.2)	2.5-30.7(9.0)
Ganj Moradabad (13)	0.23-2.85(1.00)	0.15-1.80(0.57)	3.8-13.4(7.5)	2.4-16.7(7.6)
Auras (13)	0.23-3.25(1.23)	0.28-2.75(1.04)	4.8-21.8(11.0)	4.2-45.0(15.5)
Asoha (13)	0.41-3.03(1.35)	0.17-5.10(1.81)	4.4-25.3(9.7)	3.5-47.7(15.5)
Purwa (13)	0.27-2.85(1.05)	0.12-2.20(0.93)	4.3-65.1(17.9)	4.1-43.0(19.8)
Nawabganj (13)	0.48-3.70(1.71)	0.17-4.50(1.44)	4.8-27.5(12.3)	3.0-31.0(10.6)
Bichia (13)	0.34-3.20(1.26)	0.21-3.20(0.91)	5.5-43.2(15.8)	3.6-40.3(12.2)
Bighapur (13)	0.21-1.34(0.74)	0.24-2.25(0.96)	4.5-27.4(12.4)	3.5-43.0(15.8)
Hasanganj (13)	0.42-1.36(0.73)	0.24-3.45(1.31)	5.8-50.4(23.7)	4.9-62.2(32.6)
Miyanganj (13)	0.31-1.25(0.72)	0.34-2.65(1.63)	5.6-34.5(15.7)	4.1-44.5(22.7)
Hilauli (13)	0.27-1.23(0.69)	0.16-3.10(1.37)	6.3-31.5(16.8)	4.3-38.0(25.4)
Sumerpur (13)	0.34-3.25(1.10)	0.38-3.10(1.27)	6.1-30.0(16.6)	4.3-43.7(23.2)
Critical Limit (mg kg ⁻¹)	0.6	0.2	4.5	3.5

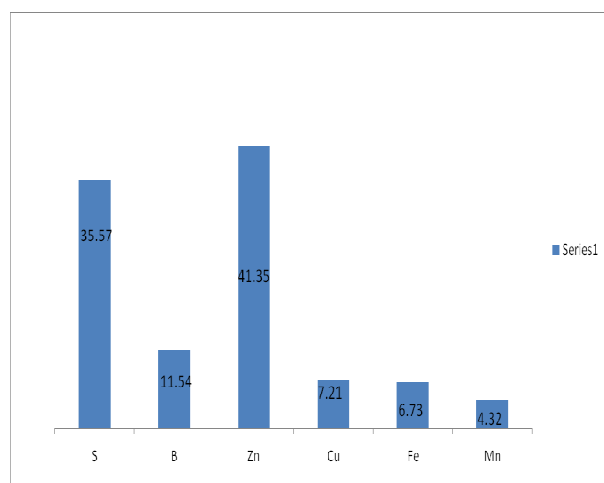


Fig. 1. Per cent nutrient deficiencies in soil samples of district Unnao

The micronutrients deficiency in the soils of Unnao district was in the order of zinc (41.3 %), copper (7.2 %), iron (6.7 %), and Mn (4.3 %).

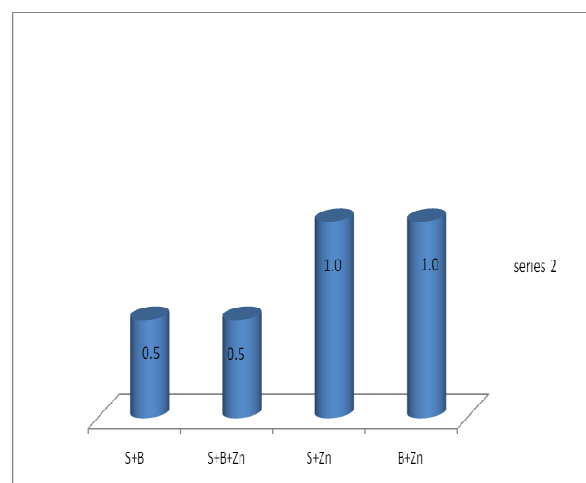


Fig. 2. Per cent multinutrient deficiencies in soil of district Unnao,

The magnitude of micronutrient deficiency might may be due to intensive agriculture and use of fertilize like DAP and urea in cultivation of

the crops. This also might be due to low organic matter content in the soils of the district Unnao. The deficiencies of micronutrients under study showed alarming situation of the district because of their very limited use by the farmer's community except zinc. The zinc deficiency may be due to phosphorus application through DAP as zinc and phosphorus have antagonistic effect on each other. The present findings are in agreement with the finding of Chaudhary *et al.* (2012), Dixit (2014) and Srivastava *et al.* (2016). The multinutrient deficiency showed 0.5 % deficiency each for S+B and S+B+Zn, while 1 % deficiency noted each for S+Zn and B+Zn. On

the basis of present study, use of straight micronutrient fertilizer is more beneficial and economical compared to micronutrient mixture. It may be concluded from the study that the deficiencies Zn, B, Cu, Fe and Mn were 41.3, 11.5, 7.2, 6.7 and 4.3 % respectively. The available sulphur deficiency was 35.6 % in the soils of Unnao. Multinutrient deficiencies were observed from 0.5-1.0 % soils. However straight micronutrients and sulphur containing fertilizer should be used for harvesting maximum and quality yield of various crops in Unnao, Uttar Pradesh.

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