International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(5): 2926-2930

Received: 11-07-2018
Accepted: 16-08-2018

S Satish
Ph. D (Soil Science), Dept. of Soil Science and Agricultural Chemistry, S.V. Agricultural College, Acharya N.G. Ranga Agricultural University, Tirupati, Andhra Pradesh, India

K Sreenivasulu Reddy
Professor and Head (Rtd.), Department of Soil Science and Agricultural Chemistry, S.V. Agricultural College, Acharya N.G. Ranga Agricultural University, Tirupati, Andhra Pradesh, India

K Venkaiah
Professor (Rtd.), Department of Soil Science and Agricultural Chemistry, S.V. Agricultural College, Acharya N.G. Ranga Agricultural University, Tirupati, Andhra Pradesh, India

Correspondence
S Satish
Ph. D (Soil Science), Dept. of Soil Science and Agricultural Chemistry, S.V. Agricultural College, Acharya N.G. Ranga Agricultural University, Tirupati, Andhra Pradesh, India

Correlation studies between soil nutrients and plant nutrients and yield of Bt cotton growing soils of Kurnool district in Andhra Pradesh

S Satish, K Sreenivasulu Reddy and K Venkaiah

Abstract
The present investigation was carried out to study the delineation of nutrient status of Bt cotton grown soils in Kurnool district of Andhra Pradesh. Based on the status report of scarce rainfall zone, 2001 (Andhra Pradesh), the soils were identified into three predominant orders *viz;* Alfisols, Inceptisols and Vertisols. The soils were slightly acidic to moderately alkaline in reaction, non saline and medium to high in organic carbon. Regarding the correlation studies, all major, secondary and micro plant nutrients were positively and significantly correlated with respective available nutrient content of the three soil orders. Further, in Alfisols, soil K, S, Fe and Zn were not significantly associated with other leaf nutrients and soil Mg, Mn and B were positively significance with leaf Ca. In Inceptisols, soil N, K, Mg and S were not significantly associated with other leaf nutrients and soil Zn, Fe and Cu were negatively significance with leaf Mn. In Vertisols, soil P, K, Ca, Mg, Cu, Fe and Mn were not significantly associated with other leaf nutrients. Further, in Alfisols and Vertisols, soil N was positively and significantly correlated with yield whereas Alfisols and Inceptisols, soil P was positively and significantly correlated with yield.

Keywords: Bt cotton, soil survey, major, secondary, micro, leaf, correlation, alfisols, inceptisols, vertisols, Kurnool district

Introduction
Soil is a naturally occurring porous medium that supports the growth of plant roots by retaining air, heat, water and nutrients and provides mechanical support to the plant and it is a reservoir of nutrients required by crops, but not necessarily at optimum levels of immediate availability to plants. The nutrient supply is the second most important limiting factor in cotton production only after water. Most often soils in the rainfed areas are not only thirsty but also hungry. It is a well established fact that adequate quantities of nutrients are needed for achieving high yields (Rochester, 2007) [9]. Cotton plant being a heavy feeder, needs proper supply of plant nutrients for its successful cultivation (Yeledhalli *et al.*, 2008) [13]. It showed better response in general to N and P while in particular to K in deficient soil. The variation in major and micronutrients supply in soil is natural phenomenon and some of the may be sufficient where others deficient. Hence, adequate supply of fertilizers and manures is essential to sustain high seed cotton yields. Keeping the above aspects and said constraints in view, there is need to scientifically analyse and statistically correlate between soil nutrients and plant nutrients and yield.

Material and Methods
The present study was “Delineation of nutrient status of Bt cotton grown soils under predominant soil orders of different villages in various mandals in Kurnool district of Andhra Pradesh”. The survey area in Kurnool district of Andhra Pradesh is located at the East longitude of 76°.58' and 79°.34,' North latitude of 14°.54' and 16°.18’ on eastern side of peninsular India.
Based on the status report 2001, scarce rainfall zone, Andhra Pradesh, the soils were identified in to three predominant orders *viz,* Alfisols, Inceptisols and Vertisols. From each of the three orders, 30 holdings totaling 90 holdings were selected. Plant samples were collected at flowering stage (60 DAS) from these 90 holdings, by counting 3rd leaf from top. All the 90 soil samples were analysed for available N was determined by alkaline permanganate method. The available P was extracted with 0.5M $NaHCO_3$ extractant and available K in the soils was

extracted by employing neutral normal ammonium acetate (Jackson, 1973) [5]. Available Ca and Mg were determined by versenate method (Chopra and Kanwar, 1991) [2] whereas available S was determined turbidimetrically using 0.15% $CaCl_2$ extractant (Cottenie *et al.*, 1979) [3]. DTPA exctractable Fe, Mn, Zn, Cu and B were determined as per Lindsay and Norvell (1978) [7]. The nitrogen content of foliar tissue was estimated by microkjeldahl distillation method (A.O.A.C., 1970) [1]. The phosphorus content of foliar tissue was determined by vanado-molybdo phosphoric yellow colour method and the concentration of potassium was determined by using flame photometer (Jackson, 1973) [5]. Ca and Mg contents were determined by versenate method while sulphur content was determined by turbidometric method (Vogel, 1978) [12]. The yield was recorded after the harvest of the crop from different farm holdings.

The data were subjected to statistical analysis by adopting the simple correlations to find out the extent of relationship between soil nutrients and plant nutrients and yield, as per the procedure described by Gomez and Gomez (1984) [4].

Results and Discussion

The present study was carried out to know the dynamics of soil nutrients at flowering stage of Bt cotton crop varied with different soil orders in relation to leaf nutrients and yields of Bt cotton in the fields of Kurnool district, Andhra Pradesh. The soil analysis was done for important physical, physico-chemical and chemical parameters and plant analysis done for all macro, secondary, micro nutrients and study the correlation between available soil nutrients and leaf nutrients and yield.

Correlation Coefficients between Available Soil Nutrients and Leaf Nutrients Status and Yield in Alfisols

Simple correlations were worked out between available soil nutrients and leaf nutrients and yield and the correlation coefficients are presented in Table 1

Major (N, P and K), secondary (Ca, Mg and S) and micro (Fe, Mn, Zn, Cu and B) nutrients in Alfisols showed significant and positive correlation with respective nutrient status in leaf samples of Bt cotton. Further, the leaf nitrogen exhibited significant and positive correlation (r = 0.626**) at five per cent level of significance with available soil nitrogen and rest of leaf nutrients positive correlation with soil nitrogen without significance difference. Leaf phosphorus showed significant and positive correlation (r = 0.436*) at one per cent level of significance with available soil phosphorus and leaf N, K,Ca, S,Zn,Cu, Fe and B positively correlated and leaf Mg and Mn negatively correlated with soil phosphorus. However leaf potassium exhibited significant and positive correlation (r = 0.533**) at five per cent level of significance with available soil potassium and leaf P, Ca, Zn, Fe nutrients positive correlation and leaf N, Mg, S, Cu,Mn and B negative correlation with soil potassium without significant difference.

Leaf calcium showed significant and positive correlation(r = 0.399*) at one per cent level of significance with available soil calcium, rest of leaf N, P, K, Mg, Cu, Fe, and Mn nutrients positively correlated and S, Zn and B negatively correlated with soil calcium. Soil magnesium was positively and significantly correlated with leaf potassium (r=0.391*), calcium (r=0.364*) and magnesium (r=0.391*) at one per cent level of significance, rest of the leaf N, P, Zn,Cu and Mn positive correlation and S, Fe and B negatively correlated with soil magnesium. Further soil sulphur was not significantly associated with other leaf nutrients but positively and significantly correlated with leaf sulphur (r=0.434*) at one per cent level of significance and negative correlation with leaf N, P, Zn, Mn and B nutrients and positive correlation with leaf K, Ca, Mg,Cu and Fe.

With respect to soil micronutrients, soil iron and zinc in soils were not significantly associated with other leaf nutrients, but positively and significantly correlated with their respective leaf iron (r=0.813**) at five per cent level of significance and leaf zinc (r=0.555**) at five per cent level of significance. Soil copper was negatively and significantly correlated with leaf magnesium (r= -0.607**) at five per cent level of significance and positively and significantly correlated with leaf copper (r=0.399*) at one per cent level of significance, rest of the leaf nutrients did not show any significance difference, but leaf N, Zn, Fe and B positive and P, K, Ca, S and Mn nutrients negative correlation with soil copper. Soil manganese was positively and significantly correlated with leaf manganese (r= 0.384*), nitrogen (r=0.380*) and leaf calcium(r= 0.465*) at one per cent level of significance, rest of the leaf nutrients did not show any significance difference. Soil boron was positively and significantly correlated with leaf calcium(r= 0.380*) and leaf boron (r= 0.743**) at one p and five per cent level of significance respectively. However, positive correlation with leaf N, Mg, S, Cu and Fe nutrients and negative correlation with leaf P, K, Zn and Mn nutrients without significance.

Further, the available soil nitrogen (r= 0.479**), soil phosphorus (r= 0.597**) and soil calcium (r=0.451*) were positively and significantly correlated with yield at five and one per cent level of significance. Remaining soil nutrients did not show any significance differences with yield component, but positive correlation with K, Mg, ZnFe, Mn and B soil nutrients and negative correlation with S and Cu soil nutrients.

Correlation Coefficients between Available Soil Nutrients and Leaf Nutrients Status and Yield in Inceptisols

Simple correlations were worked out between available soil nutrients and leaf nutrients and yield and the correlation coefficients are presented in Table 2.

Major (N, P and K), secondary (Ca, Mg and S) and micro (Fe, Mn, Zn, Cu and B) nutrients in Inceptisols showed significant and positive correlation with respective nutrient status in leaf samples of Bt cotton. Further, the available soil nitrogen exhibited the significant and positive correlation (r = 0.693**) at five per cent level of significance with leaf nitrogen content. However, soil nitrogen positive correlation with leaf K, Ca, Cu, Fe, Mn and B and negative correlation with leaf P, Mg, S and Zn nutrients without significance difference. Soil phosphorus was positively and significantly correlated with respective leaf phosphorus (r = 0.723**) at five per cent level of significance and negatively and significantly correlated with leaf sulphur (r = -0.362*) at one per cent level of significance, rest of the leaf nutrients did not show any significance difference with soil phosphorus, but positive correlation with K, Ca, Mg, Zn, Fe and B leaf nutrients and negatively correlated with N, S, Cu and Mn. However, soil potassium did not show any significant difference with all leaf nutrients, but positively and significantly correlated with respective leaf potassium (r = 0.782**) at five per cent level of significance and leaf N, P, Ca, Mg, Cu, Fe and B nutrients positive correlation and leaf S, Zn and Mn negative correlation with soil potassium without significant difference.

Soil calcium was positively and significantly correlated with leaf calcium (r = 0.368**) and leaf manganese (r = 0.468*) at five per cent level of significance and one per cent level of significance respectively. Further, leaf P, K, Mg, S and B nutrients positively correlated and N, Zn, Cu and Fe negatively correlated with soil calcium. Soil magnesium and soil sulphur were did not show any significant correlation with all plant nutrients. However, Soil magnesium was positively and significantly correlated with plant magnesium (r=0.770*), rest of the leaf P, K, Ca, Zn, Cu and Fe, Mn and B nutrients positive correlation with soil magnesium and N and S negatively correlated with soil magnesium. Further soil sulphur was not significantly associated with other leaf nutrients but positively and significantly correlated with leaf sulphur (r=0.421*) at one per cent level of significance and negative correlation with leaf P, K, Ca, Mg, Fe and B and positive correlation with leaf N and Zn.

Regarding soil micronutrients, soil zinc was positively and significantly correlated with leaf zinc (r=0.668**) and leaf iron (r=0.421**) at five per cent level of significance and negatively and significantly correlated with leaf manganese (r= -0.400*) at one per cent level of significance, rest of nutrients did not show any significance, but positive correlation with plant P, K, Mg and Cu nutrients and negative correlation with plant N, Ca, S and B nutrients. Soil iron was positively and significantly correlated with leaf iron (r=0.755**) and leaf potassium (r=0.408*) at five per cent level of significance and one per cent level of significance respectively and negatively and significantly correlated with leaf manganese (r= -0.365*) at one per cent level of significance. Soil copper was negatively and significantly correlated with leaf manganese (r= -0.368*) at one per cent level of significance and positively and significantly correlated with respective leaf copper (r=0.531**) at five per cent level of significance, rest of the leaf nutrients did not show any significance difference, but leaf N, S, Zn and Fe positive correlation and plant P, K, Ca, Mg, Mn and B nutrients were negative correlation with soil copper. Soil manganese was positively and significantly correlated with leaf manganese (r= 0.430*) at one per cent level of significance and negatively and significantly correlated with leaf zinc (r= -0.478**) at five per cent level of significance, rest of the leaf nutrients did not show any significance difference. Further, soil boron was positively and significantly correlated with leaf boron (r= 0.817**) and leaf manganese (r= 0.365*) at five per cent and one per cent level of significance respectively and negatively and significantly correlated with leaf zinc (r= -0.621**) at five per cent level of significance. However, leaf N, P, K, Mg, and Cu nutrients exhibit the positive correlation and leaf Ca, S and Fe showed negative correlation without significance.

Regarding the yield in Inceptisols, only soil phosphorus was exhibited significantly positive correlation with yield (r= 0.441*) at one per cent level of significance; remaining nutrients did not show significance difference, but positive correlation with N, K, Mg, S, Zn and Fe soil nutrients and negative correlation with Ca, Cu, Mn and B soil nutrients.

Correlation Coefficients between Available Soil Nutrients and Leaf Nutrients Status and Yield in Vertisols

Simple correlations were worked out between available soil nutrients and leaf nutrients and yield and the correlation coefficients are presented in Table 3.

Available major (N, P and K), secondary (Ca, Mg and S) and micro (Fe, Mn, Zn, Cu and B) nutrients in Vertisols showed significant and positive correlation with respective nutrient status in leaf samples of Bt cotton. Further, the soil nitrogen was exhibited the significant and positive correlation (r = 0.714**) at five per cent level of significance and negatively and significantly correlated with leaf manganese (r = -0.361*), rest of the nutrients did not show any significance difference with soil nitrogen, but positive correlation with plant P, Fe and B nutrients and negative correlation with leaf K, Ca, Mg, S, Zn, Cu and Mn nutrients. Soil phosphorus and potassium in soils were not significantly associated with other leaf nutrients, but significant and positive correlation with respective leaf phosphorus (r = 0.825**) and leaf potassium (r = 0.778**) at five per cent level of significance.

Soil calcium was positively and significantly correlated with leaf calcium (r = 0.690**) at five per cent level of significance. Further, leaf P, K, Mg and B nutrients positively correlated and N, S, Zn, Cu, Fe and Mn negatively correlated with soil calcium. Soil magnesium was positively and significantly correlated with plant magnesium (r=0.378**) at five per cent level of significance, remaining of the plant N, K, Ca and S nutrients positive correlation with soil magnesium and all micro nutrients negatively correlated with soil magnesium. Soil sulphur was positively and significantly correlated with leaf sulphur (r=0.460*) and negatively and significantly correlated with leaf phosphorus (r= -0.399*) at one per cent level of significance, rest of leaf nutrients not significantly associated with soil sulphur.

Regarding soil micronutrients, soil zinc was positively and significantly correlated with leaf zinc (r=0.473**) and leaf iron (r=0.659**) at five per cent level of significance, rest of nutrients did not show any significance, but positive correlation with plant P, K, Ca, S, Cu and Mn nutrients and negative correlation with plant N, Mg and B nutrients. Soil iron was positively and significantly correlated with leaf iron (r=0.636**) at five per cent level of significance, remaining plant nutrients did not show any significance difference, but negative correlation with leaf N, Ca, Mg, S, Mn and B nutrients and positively correlated with leaf P, K, Zn and Cu nutrients. Soil copper and manganese were not significantly associated with other leaf nutrients, but positively and significantly correlated with respective leaf copper (r=0.427*) and leaf manganese (r=0.431*) at one per cent level of significance, rest of nutrients did not show any significance difference. Further, soil boron was positively and significantly correlated with leaf boron (r= 0.502**) and plant nitrogen (r= 0.438*) at five per cent and one per cent level of significance. However, plant K, Ca and S nutrients exhibit the positive correlation and plant P, Mg and all micronutrients showed negative correlation with soil boron without significance.

Regarding the yield in Vertisols, only soil nitrogen (r= 0.411*) and boron (r= 0.378*) was exhibited significantly positive correlation with yield at one per cent level of significance; remaining nutrients did not show significance difference, but positive correlation with P, K, Zn and Fe soil nutrients and negative correlation with Ca, Mg, S, Cu, and Mn soil nutrients.

. Correlation coefficients between available soil nutrients and leaf nutrients status and yield in Alfisols, Inceptisols and Vertisols brought out the following trends.

The leaf concentrations of all the nutrients (major, secondary and micro nutrients) were positively and significantly correlated with available nutrients content of soils which were on confirmation of the findings of Srinivas *et al.* (1998) [11] wherein an increase in leaf nutrient concentration with an increase in application of nutrients to soil was observed. Further, the available N and P were positively and significantly correlated with yield and the leaf Mn concentration was negatively and significantly correlated with soil N and the leaf S concentration was negatively and significantly correlated with soil P. Lalithakumari *et al.*, (1989) [6] also reported the positive relationship between soil P and yield. Soil Ca was positively and significantly correlated with leaf Mn and yield. Similar findings were reported by Sagare *et al.*, (2001) [10]. Soil Mg was positively and significantly correlated with leaf K and Ca. Which was also on confirmation of the findings of Ramesh Kumar (1992) [8]. Soil Fe, Zn and Cu were negatively and significantly correlated with leaf Mn. Soil Mn and B were negatively and significantly correlated with leaf Zn and positively and significantly correlated with leaf N, Ca. These findings were in conformity with those of Srinivas *et al.*, (1998) [11].

Table 1: Correlation coefficients between available soil nutrients and plant nutrients and yield in Alfisols

Available Soil nutrients	Plant Nutrients											Yield
	N	P	K	Ca	Mg	S	Zn	Cu	Fe	Mn	B	
N	0.6261**	0.2468	0.0267	0.0655	0.1593	0.0824	0.3385	0.3011	0.0010	0.2056	-0.3160	0.4792**
P	0.2833	0.4363*	0.0717	0.2924	-0.2255	0.1806	0.1278	0.2057	0.2339	-0.1513	0.1460	0.5971**
K	-0.1608	0.2121	0.5335**	0.0128	-0.0313	-0.0142	0.0545	-0.3418	0.0917	-0.2601	-0.3338	0.0776
Ca	0.0159	0.0102	0.2311	0.3992*	0.3237	-0.0976	-0.2396	0.0207	0.1739	0.0545	-0.0158	0.4512*
Mg	0.1459	0.2457	0.3918*	0.3645*	0.3914*	-0.2141	0.0050	0.1704	-0.0286	0.3303	-0.1664	0.2744
S	-0.0536	-0.1958	0.0864	0.1248	0.1592	0.4343*	-0.0835	0.0029	0.1110	-0.1690	-0.0191	-0.0574
Zn	0.2602	0.2466	0.1809	0.0647	-0.0543	0.1175	0.5559**	-0.1395	-0.0449	-0.0398	-0.0719	0.1440
Cu	0.1151	-0.2083	-0.1942	-0.2034	-0.6072**	-0.0808	0.0674	0.3997*	0.2241	-0.1004	0.0575	-0.1115
Fe	0.1293	-0.1329	0.1569	0.2634	-0.0873	0.0481	0.0542	-0.0062	0.8132**	-0.0668	0.2490	0.0821
Mn	0.3804*	0.1721	0.1901	0.4655**	0.2530	-0.0267	-0.0597	-0.0077	0.0396	0.3841*	-0.1972	0.2863
B	0.0682	-0.0891	-0.2204	0.3801*	0.0008	0.1186	-0.0136	0.2005	0.0551	-0.2399	0.7439**	0.2965

* * At 1% level of significance
* At 5% level of significance

Table 2: Correlation coefficients between available soil nutrients and plant nutrients and yield in Inceptisols

Available soil nutrients	Plant Nutrients											Yield
	N	P	K	Ca	Mg	S	Zn	Cu	Fe	Mn	B	
N	0.6937**	-0.0516	0.1695	0.0013	-0.1213	-0.1616	-0.2094	0.1555	0.0807	0.2968	0.1607	0.0735
P	-0.1487	0.7237**	0.1094	0.1493	0.3387	-0.3625*	0.3202	-0.1878	0.1978	-0.1061	0.3244	0.4418*
K	0.1653	0.2972	0.7825**	0.1245	0.2007	-0.2368	-0.1074	0.1954	0.1392	-0.1117	0.1223	0.0682
Ca	-0.1177	0.0396	0.1922	0.3687*	0.2167	0.0201	-0.1500	-0.2575	-0.2580	0.4686**	0.0890	-0.1429
Mg	-0.2046	0.2225	0.2927	0.2569	0.7709**	-0.0468	0.3562	0.2135	0.1489	0.0595	0.1066	0.0184
S	0.0283	-0.2576	-0.0279	-0.0237	-0.1054	0.4216*	0.0272	-0.1948	-0.1524	-0.0700	-0.1476	0.0991
Zn	-0.2514	0.2993	0.0845	-0.2787	0.1339	-0.0455	0.6687**	0.2103	0.6420**	-0.4002*	-0.2171	0.3334
Cu	0.0480	-0.0707	-0.0346	-0.3209	-0.3300	0.0394	0.0028	0.5316**	0.2777	-0.3681*	-0.2404	-0.1344
Fe	-0.1722	0.3312	0.4082*	-0.0531	0.0842	0.1398	0.3180	0.1689	0.7551**	-0.3654*	0.0548	0.1639
Mn	0.2990	-0.0456	0.3300	0.3097	0.0732	-0.0408	-0.4783**	-0.1570	-0.1077	0.4309*	0.2370	-0.3290
B	0.2400	0.1313	0.1060	-0.1298	0.0071	-0.1986	-0.6210**	0.0487	-0.1663	0.3655*	0.8174**	-0.1412

* * At 1% level of significance
* At 5% level of significance

Table 3: Correlation coefficients between available soil nutrients and plant nutrients and yield in Vertisols

Available soil nutrients	Plant Nutrients											Yield
	N	P	K	Ca	Mg	S	Zn	Cu	Fe	Mn	B	
N	0.7143**	0.2160	-0.0011	-0.0073	-0.1885	-0.0480	-0.0489	-0.0192	0.1312	-0.3610*	0.2997	0.4111*
P	-0.0894	0.8250**	0.0323	-0.0061	0.1057	-0.0352	0.0265	-0.0370	0.2228	0.0163	0.2783	0.2191
K	-0.2424	0.0981	0.7783**	-0.2368	0.1570	-0.0757	0.2328	-0.1375	0.1183	-0.0044	0.2660	0.1733
Ca	-0.1161	0.1791	0.0132	0.6900**	0.2157	-0.1435	-0.2781	-0.0945	-0.0705	-0.3121	0.2154	-0.1646
Mg	0.0071	-0.1625	0.0127	0.3572	0.3787*	0.2714	-0.1356	-0.0162	-0.1765	-0.1888	-0.1037	-0.1227
S	-0.1669	-0.3994*	-0.0981	0.2764	-0.0076	0.4608*	0.1388	0.0494	-0.0951	-0.1629	-0.2043	-0.0925
Zn	-0.0903	0.1267	0.0048	0.0163	-0.3199	0.0067	0.4739**	0.2023	0.6596**	0.1749	-0.1021	0.1970
Cu	-0.0893	0.1182	0.1027	0.1019	0.1347	0.0987	0.2659	0.4277*	0.3265	-0.2856	0.0461	-0.0507
Fe	-0.0256	0.0638	0.0119	-0.1603	-0.0299	-0.0548	0.3586	0.2474	0.6363**	-0.0647	-0.1759	0.2208
Mn	-0.1203	0.1004	-0.0110	-0.0124	-0.2497	-0.0982	-0.0612	0.0403	0.1181	0.4318*	-0.1045	-0.2220
B	0.4387*	-0.0215	0.0442	0.1548	-0.0613	0.0278	-0.0191	-0.1099	-0.1879	-0.2444	0.5025**	0.3780*

* * At 1% level of significance
* At 5% level of significance

Conclusion

Based on correlation studies, the following relationships find out. All major, secondary and micro plant nutrients were positively and significantly correlated with respective available nutrient content of the three soil orders. Further, in Alfisols, soil K, S, Fe and Zn were not significantly associated with other leaf nutrients and soil Mg, Mn and B were positively significance with leaf Ca. In Vertisols, soil P, K, Ca, Mg, Cu, Fe and Mn were not significantly associated with other leaf nutrients. In Inceptisols, soil N, K, Mg and S were not significantly associated with other leaf nutrients and soil Zn, Fe and Cu were negatively significance with leaf Mn. Further, in Alfisols and Vertisols, soil N was positively and significantly correlated with yield whereas Alfisols and

Inceptisols, soil P was positively and significantly correlated with yield.

Thus, it can be concluded, in case of fibre crop like cotton, more detailed and systematic work needs to be done to fix the critical limits of available nutrient status especially with reference to micronutrients in soil, which is very much essential for preparing balanced fertilizer schedule for different agro-climatic regions. Hence, it can be envisaged that application of organic manures, nitrogenous fertilizers and fertilizers containing boron not only improve the soil fertility but also increase the seed cotton yield of cotton on sustainable basis and to doubling the farmers income.

References

1. AOAC. Official and Tentative Methods of Analysis. Association of Official Analytical Chemists. William Star Wetglad, Washington, 1970.
2. Chopra SL, Kanwar JS. Analytical Agricultural Chemistry. Kalyani Publishers. New Delhi. 1991, 279.
3. Cottenie A, Virloo M, Velghe G, Kiekins L. Analytical Method for Plants and Soils. State University, Ghent, Belgium, 1979.
4. Gomez KA, Gomez AA. Statistical Procedures for Agricultural Research. (2ndEdition). Wiley-Inter Science Publications, New York, 1984.
5. Jackson ML. Soil Chemical Analysis.Oxford and IBH Publishing House. Bombay. 1973, 38.
6. Lalithakumari A, Narasimha Rao PV, Tirupati Reddy A, Govinda Reddy K. Efficiency of different extractants in relation to soil phosphorus availability and extractability of phosphorus fractions under intensive cropping.The Andhra Agricultural Journal. 1989; 36(1):31-35.
7. Lindsay WL, Norvell WA. Development of DTPA soil test for zinc, iron, manganese and copper.Soil Science Society of America Journal. 1978; 42(3):421-428.
8. Ramesh Kumar D. Study of nutrient status of cotton growing areas of Prakasam district.M.Sc. (Ag.) thesis. Acharya N.G. Ranga Agricultural University, Hyderabad, India, 1992.
9. Rochester I. Nutrient uptake and export from an Australian cotton field. Nutrient Cycling in Agroecosystem. 2007; 77(3):213-223.
10. Sagare BN, Rewatkar SS, Babhulkar VP. Effect of land configuration and gypsum levels on dynamics of soil properties and productivity of cotton grown in sodicvertisols. Journal of the Indian Society of Soil Science. 2001; 49(2):377-379.
11. Srinivas G, Pillai RN, Subbaiah GV. Study of nutrient status of cotton growing areas of Guntur district. The Andhra Agricultural Journal. 1998; 5(1, 2):100-101.
12. Vogel AI. A Text book of Quantitative Inorganic Analysis. Richard clay, The Chances Press Ltd., Britain, 1978.
13. Yeledhalli NA, Prakash SS, Ravi MV. Productivepotential of soils of Tungabhadra project area for Bt cotton. Karnataka Journal of Agricultural Sciences. 2008; 21(1):35-37.