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BORON CONTENT IN FCV TOBACCO GROWN UNDER IRRIGATION IN NORTHERN LIGHT SOILS OF ANDHRA PRADESH

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FCV tobacco is grown under irrigated conditions in Northern light soils (NLS) of Andhra Pradesh. These soils are sandy to sandy loam in texture with high hydraulic conductivity and low water retentivity, acidic in reaction, very low in organic carbon, medium to high in available phosphorus and low to medium in available potassium. Available boron in these soils is in the range of 0.16 to 0.48 ppm. Boron is one of the important micronutrients essential for normal and healthy growth of tobacco, because of its participation in protein metabolism, alkaloid production, translocation, interaction with elements such as calcium and potassium, and its consequent effect on the yield and quality of tobacco crop (Tso, 1990). Earlier studies by Murthy *et al.* (1985) revealed that B – content in FCV tobacco grown in Northern light soils of Andhra Pradesh was in the range of sufficiency. However, since the crop is being cultivated continuously over years and also the new high yielding variety Kanchan was introduced, whose requirement of nutrients is very high and also since B – carrying inorganic fertilizers are not being used in raising the crop and as the soils are sandy to sandy loam in nature, there may be chances for B – depletion. In view of all these factors, studies on monitoring of boron were taken up for several years by collecting leaf samples from various locations from farmers' fields covering entire northern light soil area, the results of which are presented in this paper.

For this study, FCV tobacco leaf samples of cv 16/103 during 1991-92 season and of the varieties CM-12 and 16/103 during 1993-94 season were collected from different plant positions (P, X, L & T) from the NLS farm of Jeelugumilli. During 1991-92, leaf samples were collected plant position-wise from farmers' fields also. Simultaneously this study was extended to more number of locations by collecting leaf samples mainly from X and L positions under Devarapalli, Koyyalagudem and Jangareddygudem platforms spread over entire NLS area during 1992-93, 1993-94 and 1994-95 seasons. In late 90's the new high yielding cv Kanchan replaced the previous varieties in the entire NLS area. Hence, during 2001-02 and 2002-03 seasons, cured leaf samples of cv. Kanchan were collected from different stalk positions grade-wise from different locations covering entire NLS area. During 2003-04 and 2004-05 seasons, leaf samples were collected mainly from X and L positions from all the NLS platforms. The lamina portion of these samples was dried at 60°C and powdered to pass through a 60 mesh plastic sieve and analysed for boron as per the method of Powell Gaines and Allen Mitchell (1979).

Data on boron content of FCV tobacco grown in NLS over years are presented in Table 1. Data on boron content in FCV tobacco leaf from different plant positions and from different grades in each plant position are presented in Table 2 and 3, respectively. The data revealed that leaf boron content over years was in the range of sufficiency in all the ruling varieties of the respective periods in NLS despite continuous cultivation of FCV tobacco even without applying boron fertilizers. Hutcheson and Woltz (1956) and Murthy *et al.* (1985) reported that boron deficiency occurs when the leaf B-content falls below 15-16 ppm in leaf. Tandon (1993) reported that a range of 20-50 ppm boron in the leaf is the sufficiency range for tobacco. Boron content of FCV tobacco in NLS was well above the deficiency level. As regards the stalk position, boron content increased from P-position to T-position (Table 2). No clear-cut differences were noticed in boron content in different grades in each plant position (Table 3).

Boron sufficiency in FCV tobacco from NLS can be attributed to the following reasons. The tobacco is a wide spaced (1.0 x 0.6 m in NLS) crop

Table 1: Boron content in FCV tobacco leaf collected from NLS

Year	Location/ Platform/ Plant position	Variety	No. of samples	Boron (ppm)		SD ±
				Range	Mean	
1991-92	Jeelugumilli Farm	16/103	12	35.75-71.83	50.08	12.69
	Jeelugumilli farmers' fields	16/103	9	19.92-44.42	31.25	8.41
	Taduvai farmers' fields	16/103	6	27.68-34.32	30.96	2.55
	Utlapalli farmers' fields	16/103	9	17.07-41.48	28.30	8.77
1992-93	Devarapalli Platform	16/103	10	26.74-60.07	39.53	11.81
	Koyyalagudem Platform	16/103	10	25.39-69.66	40.27	13.45
	Jangareddygudem Platform	16/103	10	23.74-55.32	35.66	10.50
1993-94	Jeelugumilli Farm	CM-12	12	19.41-80.48	41.54	22.46
	Jeelugumilli Farm	16/103	12	20.04-84.60	44.86	23.91
	Devarapalli Platform	16/103	24	23.09-83.82	44.70	18.76
	Koyyalagudem Platform	16/103	24	25.80-110.22	52.75	25.62
	Jangareddygudem Platform	16/103	24	25.07-78.10	43.10	16.36
1994-95	Devarapalli Platform	16/103	20	26.85-78.52	53.18	15.80
	Koyyalagudem Platform	16/103	20	24.51-68.44	38.46	12.17
	Jangareddygudem Platform	16/103 & CM-12	20	17.03-85.67	43.57	20.34
2001-02	Entire NLS area					
	P-Position	Kanchan	7	27.88-37.96	32.09	3.30
	X-Position	Kanchan	12	26.21-57.96	40.34	10.05
	L-Position	Kanchan	21	34.17-81.88	61.55	13.52
	T-Position	Kanchan	2	57.89-71.14	64.52	9.37
2002-03	Entire NLS area					
	P-Position	Kanchan	29	26.66-75.06	41.67	12.09
	X-Position	Kanchan	63	22.39-78.59	44.24	12.99
	L-Position	Kanchan	54	32.80-103.04	62.37	17.73
	T-Position	Kanchan	23	38.53-112.21	75.61	21.96
2003-04	Samples from all NLS Platforms	Kanchan	15	24.63-68.14	42.24	13.77
2004-05	Samples from all NLS Platforms	Kanchan	18	26.70-67.19	44.20	13.42

Table 2 : Boron content (ppm) in different plant positions of NLS tobacco

Year	Variety	P	X	L	T
1991-92(Jeelugumilli)	16/103	36.86	43.18	51.25	69.05
1993-94 (Jeelugumilli)	CM-12	20.70	25.00	47.36	73.09
1993-94 (Jeelugumilli)	16/103	21.02	25.73	57.11	75.59
2001-02 (Farmers' fields)	Kanchan	32.09	40.34	61.55	64.52
2002-03 (Farmers' fields)	Kanchan	41.67	44.24	62.37	75.61

Table 3 : Boron content in different grades of FCV tobacco leaf from NLS (Mean of 2001-02 & 2002-03 seasons)

P- Position		X- Position		L- Position		T- Position		Other grades	
Grade	Boron (ppm)	Grade	Boron (ppm)	Grade	Boron (ppm)	Grade	Boron (ppm)	Grade	Boron (ppm)
P1L	40.74	X1L	35.11	L1L	41.30	T2O	69.54	BG	70.07
P2L	32.92	X2L	40.98	L2L	53.32	T3O	56.14	BMG	62.21
P3L	39.02	X3L	46.54	L3L	51.23	T4O	51.13	NOG	53.22
P4L	41.66	X4L	46.28	L4L	57.07	T5O	95.62	TG	65.35
P5L	36.90	X5L	51.77					TMG	93.73
P1O	32.99	X1O	41.12	L1O	63.05	T4R	91.73		
P2O	36.57	X2O	45.42	L2O	69.64	T5R	77.24		
P3O	48.64	X3O	42.78	L3O	64.58				
P4O	41.58	X4O	41.95	L4O	51.88	T2J	71.14		
	X5O	48.17	L5O	47.47					
P3J	37.96	X1J	35.04	L1J	50.45				
	X2J	48.18	L2J	76.26					
	X3J	45.26	L3J	59.31					
	X4J	48.15	L4J	66.37					
			L5R	68.87					
Mean	**38.72**		**42.72**		**60.97**		**70.23**		**63.16**
No. of samples	**29**		**68**		**69**		**22**		**14**

and the plant is deep-rooted and hence, this crop can tap and utilize boron from more volume and lower depths of the soil as compared to cereals. Application of FYM (16.95 ppm boron) or FPC (10.45 ppm boron) or green manuring is a practice in NLS to improve the soil structure. Boron present in these organic sources is also utilized by the crop. In addition, the irrigation water is a good source of boron (0.08-0.44 ppm). Since the crop receives about 10 irrigations, each irrigation adds a considerable quantity of boron to the soil, which can be easily utilized by the crop. In such a situation, where irrigation is a practice, even if the soil available boron is on the lower side, the leaf contains higher amounts of boron, for the reason that much boron is supplied through the irrigation water. In fact, the leaf boron content of the irrigated FCV tobacco crop of NLS is very high as compared to FCV tobacco from other zones (TBS 20.19 – 50.12 ppm; SLS 23.34 – 35.31; KLS 20.24 – 38.85 ppm). Murthy and Prasad (1986) also reported that although the boron content in the soil, in some locations of the northern light soils was on the lower side (~ 2 ppm), the crop did not suffer B- hunger, since boron content present in the irrigation water meets the crop's demand. In such a situation, even the slightest addition of this micronutrient may lead to toxicity and affect the yield and quality of leaf.

Hence, it can be concluded that the boron content is in the range of sufficiency in the tobacco grown in NLS area under irrigated conditions and thus supplementation of this micronutrient is not warranted at this juncture. However, periodic monitoring is necessary to detect and correct any disorders.

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