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Study of quality and chemical characteristics of tobacco cultivars(Nicotiana tabaccum)

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ABSTRACT: Nitrogen and potash are primary elements that are absorbed relatively early in plant's life. They are most important elements that affect the growth and development of tobacco plant and the quality of leaf tobacco. This study was performed in order to understand more clearly differences between different varieties of tobacco in quality and chemical characteristics, six fire-cured varieties of tobacco were examined, DRVI, DRV10, Madole, Kentucky 171, Toleza 68 and Western for absorption and accumulation determination potash and nitrogen in different plant parts at stages of growth, and quality characteristics. Plants were grown in an unheated greenhouse in March, and then seedling transplanted into the field in spring, and in a randomized complete block design (RCBD) was planted with four blocks in field of Tirtash Tobacco Research Institute. Results showed that there were significant differences between different cultivars in percentage of root potash, root nitrogen, leaf nitrogen, stem potash and percentage of sugar. But percentage of leaf potash, stem nitrogen, nicotine, total ash and burning time were not different between different varieties. Amount of potash and nitrogen in different plant parts varieties were different at different stages of growth. The maximum and minimum absorption of potash and nitrogen were observed at early and late stages of growth (42-58 and 94-122 days after planting), respectively.

***Keywords*:** characteristics of tobacco, Study of tobacco, tobacco, Nicotin

INTRODUCTION

Tobacco is the most widely grown commerical nonfood crop in the world. The quality and chemical properties of leaf tobacco cultivars are influenced by genetics, agricultural practices, soil type, nutrition absorption and etc (Miner and Tucker ,1990). Assessmant of leaf quality depends primarily on the relative concentration of various organic constituents and inorganic constituents (Tso ,1990). Practical application of plant analysis as a diagnostic tool rests essentially on the assumption that a rapid and positive relationship exists between soil nutrient supplies within the root zone and the concentration of those nutrients in the plant (Bruns and Mcintosh ,1988; Legget et al., 1987). Nitrogen and potash affect the grown of tobacco than any other nutrient. Amount of nitrogen and potash in different plant parts varieties are different at stage of growth. The uptake of potash and nitrogen are very high during the early stages of growth and diminishes from about topping onwards, when release from mineral reserves balances uptake (Elliot ,1968; Goenaga et al., 1989). (Sreeramamurty and Gopalachari ,1985) reported that a gradual reduction in the percent nitrogen with age of the plant from 30th day to 120th day . (Goenaga et al .,1989) studied uptake of nitrogen by flue-cured tobacco, that about 80% of total nitrogen in tissues of plant had been taken up during the first weeks after transplanting that exhibiting rapid growth rates of plant parts, environmental conditions and hence high sink capacities for nitrogen. (Evanylo et al .,1988) reported that nutrition absorption were influence plant genetic, weather and fertilization. (Drossopolulos et al.,1997) reported that potassium effects organic acid metabolism and is strongly related to the burning properties of the cured leaves. (Raper and Mc cants ,1976) found relative growth rates and relative accumulation rates of nitrogen and potassium a flue- cured cultivars in phytotrons were unaffected by temperature and nutrient supply. (Bruns and Mcintosh ,1988) reported that differences among flue-cured, burly and cigar wrapper tobaccos may reflect cultural, genetic distinctions, and management practices. The objective of this work was study of quality and chemical characteristics of six tobacco cultivars (Nicotine tabaccum).

MATERIAL AND METHODS

Six fire-cured varieties of tobacco (DRV1, DRV10, Madole, kentuckey 171, Toleza 68 and western) were planted in field of Tirtash Research and Education Centre on sandy-loam soil. Cultural practices were optimum for leaf production and same for all cultivars. Fertilizer application was at the rate of 52 kg N hac-1, 96 kg p2o5 hac-1 and 185 kg k2o hac-1. The experimental design was a randomized block with four replication and plot size 40 m2. Tobaccos were manually topped at the early flowering stage above 20th leaf and the wound treated with a maleic hydrizied, 15 lit/hac to prevent lateral sucker growth. During the growing period (42, 58, 94 and 122 days after transplanting) the following data were taken as an average of three, randomly selected plants from each plot, percentage of nitrogen and potassium in different plant parts varieties, (root, stem and leaf). All plant parts was dried at 70°c and ground in a wiley mill to pass a 1 mm sieve in preparation for chemical analyses. Percentage of nitrogen and potassium of plants were determined by kjeldal and flamephotometr methods, respectively. Quality factors (nicotine, total ash, burning time and sugar) were measured on the middle leaves cultivars per plot. The collected data were subjected to variance analysis using EXCEl software. Statistically significant differences among the means were determined by using LSD, with MSTATC software.

RESULTS AND DISCUSSION

Results:

Leaf quality characteristics:

Nicotine, total ash and burning time were not significant differences between cultivars, but were significant differences between cultivars in percentage of sugar (p<0/05) (Table 1). The maximum and minimum sugar percentages were observed in Toleza 68 and DRV1, respectively.

Table 1. Mean of cultivars leaf quality characteristics

Cultivars	Total ash ^{ns}	Burning time ^{ns}	Sugar *	Nicotine ^{ns}
DRV_1	13/87 a	11/5 a	3/37 ab	2/77 a
DRV_{10}	15/47 a	11/02 a	2/25 c	3/12 a
Madole	14/45 a	8/12 a	2/75 bc	2/71 a
Kentucky 171	15/52 a	8/52 a	3/6 ab	3/19 a
Toleza 68	14/52 a	9/07 a	3/9 a	3/16 a
Western	14/95 a	9/57 a	2/95 abc	2/82 a

ns, *: Non significant, significant at P= %5, respectively

Leaf, Root and stem potash percentage:

Cultivars were not significant differences in percentage of leaf potash at stages of growth. Cultivars leaf potash increased from 42 to 58 days after transplanting (DAT) and then decreased (Fig 1). Results showed that stem potash percentage were significant differences between cultivars at 42 and 122 DAT and root potash was at 58 DAT. The maximum absorption of stem and Root potash were at 42 DAT and then decreased (Table 2). Percentage of root potash increased for DRV1 and DRV10 cultivars at 58 DAT. Amount of stem potash in varieties was more from leaf and root potah.

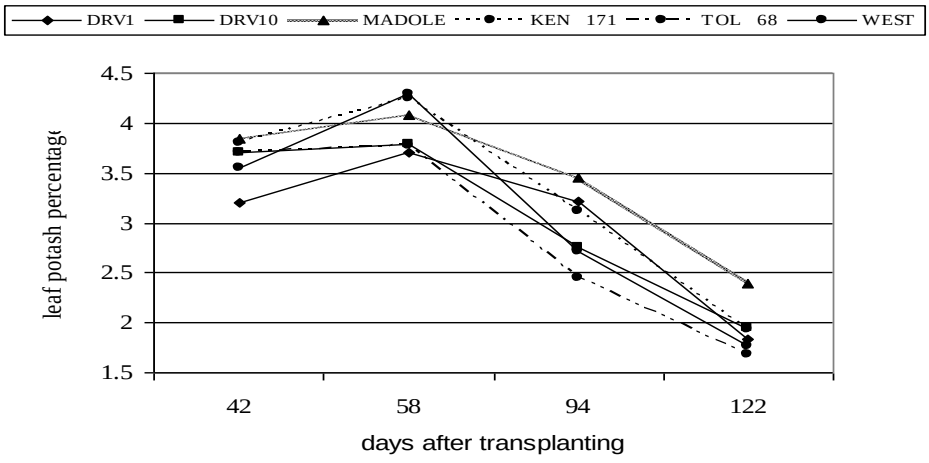

Figure1. percentage of cultivares leaf potash

Table 2. Mean of stem and root potash percentage in tobacco cultivars

	Stem (DAT)				Root (DAT)			
	42	58	94	122	42	58	94	122
Cultivars	*	ns	ns	*	ns	*	ns	ns
DRV_1	5/4 d	5/00 a	3/86 a	2/12 c	2/71 a	3/71 a	2/01 a	0/82 a
DRV_{10}	6/7 ab	5/2 a	3/81 a	2/71 ab	2/58 a	3/01 bc	1/56 a	0/77 a
Madole	7/00 a	5/2 a	3/81 a	3/04 a	3/46 a	3/05 abc	1/72 a	0/66 a
Kentucky171	5/56 abc	4/94 a	3/65 a	2/26 bc	3/41 a	2/4 c	1/74 a	0/66 a
Toleza 68	5/5 cd	5/32 a	3/55 a	2/35 bc	3/69 a	3/51 ab	1/61 a	0/67 a
western	6/66 abc	5/2 a	3/61 a	2/36 bc	3/17 a	3/12 ab	1/65 b	0/69 a

ns, *: No significant, significant at P= %5, respectively

Percentage of leaf, stem and root nitrogen:

Cultivars were significant differences in leaf nitrogen percentage at 122 DAT (p<0/05). Leaf nitrogen increased with time from transplanting to flowering and decreased at late stages of growth (Table3).Varieties weren't significant differences in stem nitrogen percentage. The maximum Absorption of stem nitrogen was at 42 DAT and then declined (Fig. 2). Changes in root nitrogen percentage of cultivars were significant differences (p<0/01) and other stages of growth weren't significant differences between cultivars. The maximum absorption of root nitrogen was at 42 DAT and declined from 58 to 122 DAT. Amount of root nitrogen in cultivars was more from leaf and stem nitrogen (Table 3).

Table 3. Mean of leaf and root nitrogen percentage in tobacco cultivars

	Leaf (DAT)				Root (DAT)			
	42	58	94	122	42	58	94	122
Cultivars	*	ns	Ns	*	ns	*	ns	ns
DRV_1	2/84 a	3/5 a	4/42 a	2/42 a	3/10 a	2/81 ab	1/69 a	1/39 a
DRV_{10}	3/14 a	3/52 a	4/02 a	2/49 bc	3/00 a	2/37 bc	1/40 a	1/25 a
Madole	3/24 a	3/63 a	4/13 a	3/14 a	3/21 a	3/47ab	1/73 a	1/22 a
Kentucky171	3/15 a	3/39 a	3/76 a	2/38 bc	2/63 a	1/83 c	1/43 a	1/23 a
Toleza 68	2/9 a	3/48 a	3/81 a	2/25 bc	3/11 a	2/98 a	1/48 a	1/10 a
Western	3/5 a	3/58 a	3/87 a	2/10 c	3/08 a	2/94 ab	1/76 a	1/10 a

ns, *, **: No significant, significant at P= %5, significant at P=%1, respectively

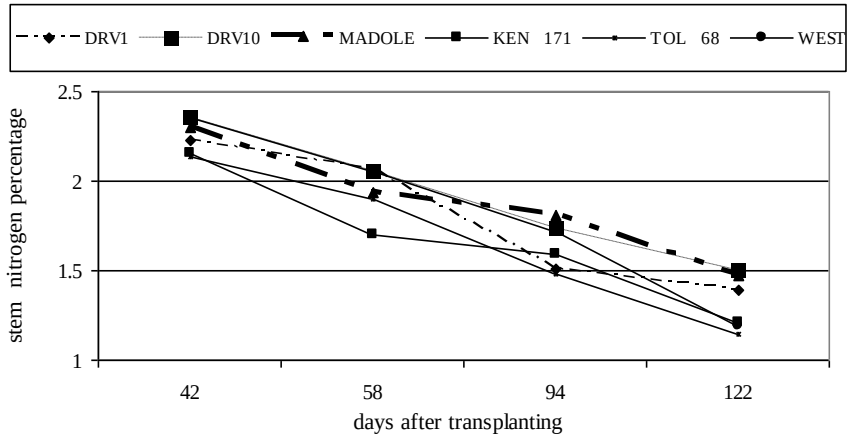

Figure 2. Percentage of cultivar stem Nitrogen

Discussion:

Quality:

Cultivars sugar differences contribute to leaves curing conditions, hydrolysis of starch to free sugars, leaves ripeness and genetically factories (Tso ,1990).

Potash:

Potash amount of cultivars related to soil potash, absorption, Transport, partitioning percent to parts and environmental conditions (Elliot ,1968, Ghulam and Gul ,1992). High amount of potash in different plant parts varieties indicates high relative growth rate of parts and available potash in soil at early stages growth. Plant senescence, decrease of plant parts activity and soil potash may be related to decline potash in cultivars parts at late stages of growth (Janardhan et al., 1990). Stem and root potash high contents in madole and DRV1, (respectively) were due potash Rapid translocation to stem from root, root high activity and improved k-use efficiency this cultivars.

Nitrogen:

The uptake of cultivars nitrogen related to soil nitrogen storage, absorption, Transport and nitrogen partitioning percent in different plant parts varieties (Bruns and Aycock ,1987). Parts nitrogen contents were relatively high due parts activity, high relative growth rate, and amount of soil sufficient nitrogen during early growth. Tissue nitrogen amount declined with senescence, decrease of growth and soil nitrogen deplete at late stages of growth. Percentage of leaf nitrogen in madole and DAV1 cultivars were nearly high due to period of long growth, low of leaf nicotine amount and rapid transport of stem and root nitrogen to leaves. Root of kentuckey 171 and DAV10 contained low concentration of nitrogen due to decrease of soil nitrogen uptake efficiency and root activity, and nitrogen was adsorbed for synthesis of nicotine in leaves (Raper and Cants ,1976).

REFERENCES:

Bruns, H. A. and M. S. Mcintosh. (1988). Growth rates and nutrient concentrations in Maryland tobacco, Tob. Sci. 32: 82- 87.

Bruns, H. A. and M. K. Aycock. (1987). Relationship of leaf mineral composition to certain agronomic and quality traits of Maryland tobacco. Tob. Sci. 32:20- 23.

Drossopoluloes, J. B., A., J. karamanos and G. G. kouchaji. (1997). A survey of selected nutrition levels at different leaf position of oriental field grown tobacco plants. Tob. Sci. 36:10-15.

Elliot, J. M. (1968). Effect of applied potassium on certain agronomic chemical and physical characteristics of flue- cured tobacco. Tob. Sci. 12: 151-157.

Evanylo, G. K., J. L. sims and J. H. Grove. (1988). Nutrient norms for cured burley tobacco. Agron. J. 80: 610-644.

Goenaga, R. J., R. J. volt and R. C. long. (1989). Uptake of nitrogen by flue–cured tobacco during maturation and senescence. I. Partitioning of nitrogen derived from soil and fertilizer sources. Plant and soil. 120: 133-139.

Ghulam, F. M. and H. Gul .(1992). Effete of different dos of potassium fertilizer on growth, yield and quality of F. C. V. tobacco. Pak. Tobacco. XVI: 13-16.

Janardhan, K. V., N. Janakiraman, S. P. Nataraju and K. P. subramaniam. (1990). Nitrogen and potassium nutrition of flue-cured tobacco in transitional light soil of karnataka. Field crop Abstr. 44: 1083.

Kroontje W., A. Badr and H. C. H. Hahne. (1972). Growth pattern of burley 21 tobacco and associated nitrogen and nicotine levels in plant parts. Tob. Sci. 16: 46-51.

Legget J.S., S. J. Crafts-Brander and J. F. Chaplin. (1987). Effect of root system genotype on nitrogen accumulation by burley and flue-cured tobacco. Field Crop Abstr. 40:562.

Ramakrishnayya B.v. and V. krishnamurthy. (1987). Distribution pattern of potassium in flue-cured tobacco leaf Indi. J. plant physiol. 33: 72-75.

Raper C. P. Jr. and C. B. MC cants . (1976). Influence of nitrogen nutrition on growth of tobacco leaves. Tob. Sci- 11: 175-9.

Miner G. S. and M. R. Tucker . (1990). Plant analysis as an fertilizing tobacco. Filed crop Abstr. 44: 766.

Sisson V. A., T. W. Rufty and R. E. willamson. (1991). Nitrogen- use efficiency among flue- cured tobacco genotypes. Crop sci. 31: 1615-1620.

Sreeramamurtry C. H. and N. C. Gopalachari . (1985). Influence of sources of nitrogen on the yield, protein and non- protein nitrogen status of flue-cured tobacco at different stages of plant growth. Tob- sci: 11: 36-45.

Tso. T. C. (1990). Production, physiological and biochemistry of tobacco plants. IDEALS, INC. Maryland, USA.