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Study Potash uptake in Tobacco (Nicotiana tabaccum)

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ABSTRACT: Potash is primary element that is absorbed relatively early in plant's life. It is most important element that affects the growth and development of tobacco plant and the quality of leaf tobacco. This study was performed in order to understand more clearly Potash uptake different varieties of tobacco in quality and chemical characteristics, varieties of tobacco were examined, DRVI, DRV10, Madole, Kentucky 171, Toleza 68 and Western for absorption and accumulation determination potash in different plant parts at stages of growth, and quality characteristics. Plants were grown in a 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, stem potash and percentage of sugar. But percentage of leaf potash, nicotine, total ash and burning time were not different between different varieties. Amount of potash in different plant parts varieties were different at different stages of growth. The maximum and minimum absorption of potash were observed at early and late stages of growth (42-58 and 94-122 days after planting), respectively.

***Keywords*:** Potash, Burning time, Nicotine, Absorption, Root.

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 (13, 16). Assessmant of leaf quality depends primarily on the relative concentration of various organic constituents and inorganic constituents (13). 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 (1, 10, 13). Nitrogen and potash affect the grown of tobacco than any other nutrient. Amount of potash in different plant parts varieties are different at stage of growth. The uptake of potash is very high during the early stages of growth and diminishes from about topping onwards, when release from mineral reserves balances uptake (4, 6, 7, 13). Sreeramamurty and Gopalachari (15) reported that a gradual reduction in the percent elements with age of the plant from 30th day to 120th day. Goenaga et al (6) studied uptake of elements by flue-cured tobacco that about 80% of total elements in tissues of plant had been taken up during the first weeks after transplanting that exhibiting rapid growth rates of plant parts, environmental conditions. Evanylo et al (5) reported that nutrition absorption were influence plant genetic, weather and fertilization. Drossopolulos et al (3) reported that potassium effects organic acid metabolism and is strongly related to the burning properties of the cured leaves. Raper and Mc cants (12) 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 (1) 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 potash and chemical characteristics of cultivars (Nicotine tabaccum).

Materials and methods:

Cultivars of tobacco (DRV_1, DRV_{10}, Madole, kentuckey 171, Toleza 68 and western) were planted in field of Tirtash Tobacco Research Institute on sandy-loam soil. Cultural praxes were optimum for leaf production and same for all cultivars. Fertilizer application was at the rate of 52 kg N hac^{-1}, 96 kg p_2o_5 hac^{-1} and 185 kg k_2o hac^{-1}. The experimental design was a randomized block with four replication and plot size 40 m^2. 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 potassium in different plant parts varieties, (root, stem and leaf). All plant parts was dried at 70^{oc} and ground in a wiley mill to pass a 1 mm sieve in preparation for chemical analyses. Percentage of potassium of plants were determined by 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:

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 percentage was observed in Toleza 68 and DRV_1, respectively.

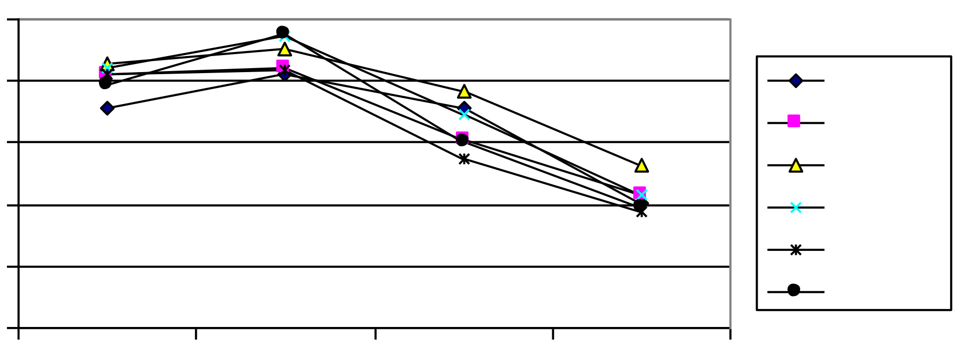
Table 1. Mean of cultivars leaf quality characteristics

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 potash percentage:

Cultivars were not significant differences in percentage of leaf potash at stages of growth cultivars leaf potash increased from 42 to 58 DAT and then decreased (Figure 1).



Root and stem potash percentage:

Results showed that stem potash percentage were significant differences between cultivers 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 DRV_1 and DRV_{10} cultivars at 58 DAT. Amount of stem potash in varieties was more from leaf and root potash.

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

Stem (DAT)					Root (DAT)			
Cultivars	42 *	58 ns	94 ns	122 *	42 ns	58 *	94 Ns	122 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
DAT: days after transplanting

Discussion:

Quality:

Cultivars sugar differences contribute to leaves curing conditions, hydrolysis of starch to free sugars, leaves ripeness and genetically factories (10, 16).

Potash:

Potash amount of cultivars related to soil potash, absorption, Transport, partitioning percent to parts and environmental conditions (4, 7, and 11). 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 (8, 13). Stem and root potash high contents in madole and DRV_1, (respectively) were due potash Rapid translocation to stem from root, root high activity and improved k- use efficiency this cultivars.

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