PHYSIOLOGICAL AND YIELD RESPONSE OF TOBACCO TO POTASSIUM

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C O N T E N T S

I. INTRODUCTION

Inspite of the ever-increasing importance of tobacco in the agricultural economy and the ramarkable increase in recent years in processing and consumption of tobacco products, in the UAR, yet tobacco is not grown for commercial uses. Tobacco plants in UAR are grown in a very narrow scale for research purposes in recent years.

This work was designed to investigate the effect of potassium level, its carrier and its time of application on the growth, and yield of tobacco plants. Due consideration was given to the effect of these factors on the chemical contents of tobacco plants during their growth period.

II. REVIEW OF LITERATURE

Much experiment work has been conducted in different places to investigate the effect of different amounts of potassium on yield and growth of tobacco plant. So far the author is aware, no much work in UAR was carried out regarding the relationship between potassium fertilizer and yield of tobacco plant.

A- Growth

1- Effect of level of potassium fertilizer on the growth of tobacco plant.

Results obtained by Staff members of Cowtharm Institute (1946) working on nutritional studies using Nile river sand and fertilized with a complete 4-8-4 mixture at 1200 lb./acre, plants showed that extra potassium did not greatly affect the amount of growth of tobacco plant.

Bowling and Brown (1947) found that potassium increased the weight of tobacco leaf.

Nishikawa and Ichichima (1952) reported that the weight of tobacco plant, the total number of useful leaves on the plant and the mean length of the stem internodes decreased as the amount of potassium suppl

increased. They added that the fresh weight of middle and top leaves were reduced by excessive potassium. Potassium was supplied as sulphate, the levels of K_2O varying according from 0 to 8 gram per pot.

Bhat (1957) on cotton soils of Andhra Prades found that in numerous experiments with flue-cured Virginia tobacco no responses to potassium were observed.

Schipfer (1959) demonstrated that potassium deficiency symptoms on tobacco yields in Austria were observed in spite of applications of K_2O as high as 250 kg. per hectar. He added that the height of plant, length and width but not number of leaves increased with amounts of K_2O applied.

4- Effect of potassium carrier on the growth of tobacco plant.

It was recommended by the Agronomy Tobacco Conference held in the Southern States of the U.S.A. (1946) working on flue-cured tobacco that a small amount of Cl increased the value of the crop but excess of Cl injured growth. The mixture should contain 2 % or where the pH of soil is over 5.6 the maximum may be 3 %.

Bowling and Brown (1947) working on Maryland tobacco found that sulphate increased the average height of plants and the length of internodes but did not affect the number of

leaves. They added that muriate produced more leaves and shorter internodes. than sulphate .

Wedin and Struckmeyer (1955) demonstrated that average length and weight of leaves decreased as SO_4 levels were increased beyond 96 p.p.m. They added that plants grown at lower Cl exhibited no marked growth responses, but increased in average length and weight of leaf.

Chouteau (1961) using concentration of 0.5 to 1 m.eq./sulphate found that higher concentration did not improve growth of tobacco plant. He added that leaves became necrotic when the K : SO_4 ratio was nearer to or below one.

Pal et al (1963) found that by using the levels of Cl (0 , 0.99, 1.98, 3.96, 5.94 gm. per plant) with a uniform supply of other nutrients in sand culture the growth of leaves was not influenced by Cl supply.

B- Chemical Composition

1- Effect of potassium application on the chemical composition of tobacco plant.

Askew et al (1947), Wober and Peer (1957) and Chouteau (1964) found that increasing the proportion of potassium in fertilizer slightly increased the potassium content of tobacco plant.

Dela (19.7) found that by increasing the amount of potassium applied up to 180 lb./acre was followed by an increase assimilable potassium and of potassium content of the plant.

Woltz et al (1948) indicated that by using 30-150 lb/acre of K_2O in combination of fertilizers the nicotine content was independent of potassium and Cl content of tobacco plant.

McEvoy (1951) in sand culture applied the fluecured tobacco at first with a complete nutrient solution of optimum concentration it was topped after eight weeks of growth. He found that a decrease of potassium rec resulted in a reduction in potassium content in tissues.

Nishikawa and Ichichima (1952) demonstrated that there was no definite relationship between nitrogen and nicotine contents and amount of potassium supplied.

Kakehashi and Yoshida (1952) revealed that phosphorus content was not affected by increasing potassium concentration.

Schipfer (1959) found that lack of potassium caused low potassium contents of leaves and the phosphorus content of the leaves did not change significantly with changing potassium fertilizer.

of Potassium fertilizer

McCants (1960) showed that at higher amounts (greater than 50 lb./acre) the potassium content of the cured leaves increased.

3- Effect of potassium carrier on the chemical composition of tobacco plant.

Askew et al (1947) revealed that by increasing muriate the chloride content of tobacco plant increased.

Wedin and Struckmeyer (1955) indicated that chloride percentage in leaf was increased to a greater extent by additional chloride ion.

Takahashi and Yoshida (1957) demonstrated that increasing cultural chloride concentrations increased chloride leaf contents. They added that chloride content was unaffected by sulphate supply.

Neas (1961), Elliot and Vickery (1961) and Copalachari (1962) showed that chloride content of leaf increased by increasing chloride supply.

Atkinson et al (1962) reported that sulphate fertilizers tended to increase the chloride contents of leaves though chloride was low.

Copalachari (1962) indicated that chloride did not influence the uptake of the other elements except phosphorus which increased by increasing chloride.

C - Y i e l d

- Effect of potassium application on the yield of tobacco plant.

Olson and McEvoy (1945) found on Cigar tobacco that potash appears to have a great influence on quality than on yield, the effect of adequate potassium manuring on yield, was negligible. They added that 200 lb. of K_2O per acre gave additional increases of yield and quality.

Harmony Tobacco Conference for flue-cured tobacco in the southern states of U.S.A. (1946), indicated that potassium influences the yield of flue-cured tobacco plant and that 80-100 lbs per acre of K_2O should be applied.

Higher doses of K_2O did not influence the quality of tobacco leaves, Le Rose and Legron (1950).

McEvoy (1951) by using sand cultures, set out to grow flue-cured tobacco with a complete nutrient solution at optimum concentration and after eight weeks of growth the potassium content of the solution was reduced by fifty per cent, found that a decrease of potassium reduces the yield of tobacco plant.

By using Orinico tobacco, Turpin (1952) showed that by application of 240 pounds of available K_2O per(morgen) as chloride and sulphate forms gave the best yields of tobacco plant and above these levels both forms depressed yields.

Stinson (1953) at southern Rodesia found that the leaf yield increased by applying 90 pounds of K_2O per acre.

Elliot and Vickery (1954) in field experiment using flue-cured tobacco grown on sand soil demonstrated that application of 180 pounds of K_2O per acre gave highest yield.

Walker (1955) indicated that additional application of potassium may be beneficial for some soils. There was no benefit derived from increased potassium under the condition of this experiment (irrigated flue-cured tobacco).

Berbec and Berezowski (1956) on the basis of the experiment conducted on a Vistula alluvial soil, ~~it could be~~ concluded that additional potassium fertilization highly influenced yields especially during years favourable for the growth and development of tobacco. They added that best results were obtained with the application of 72 Kgs. of K_2O per hectar.

Bhat (1957) showed in numerous experiments with flue-cured tobacco that no response to potassium was observed.

Increasing potash applications above 80 pounds of K_2O per acre gave no significant yield increase in either the two or the three year rotation as demonstrated by Laprade et al (1957).

Increasing K_2O application from 80 to 160 pounds per acre produced a significant increase in yield as revealed by McIlvaine et al (1957) but a further 80 pounds did not.

Wallace (1958) working on shade tobacco found that yield was influenced only slightly by K_2O at 100-200 pounds per acre and added that the basic treatment of 200 pounds of K_2O was as good as high rates with 125 pounds of P_2O_5 and 200 pounds of nitrogen.

Sajnani and Dhyani (1959) showed that by applying K_2O at 0 , 50 and 100 pounds per acre to chewing tobacco, the potassium response did not reach significance in any year (5 seasons).

Dimitrijevic (1960) reported in experiments over 4 years on Nicotiana rustica in 3 localities that the highest yield was produced by application rates did not produce proportional increase in yields.