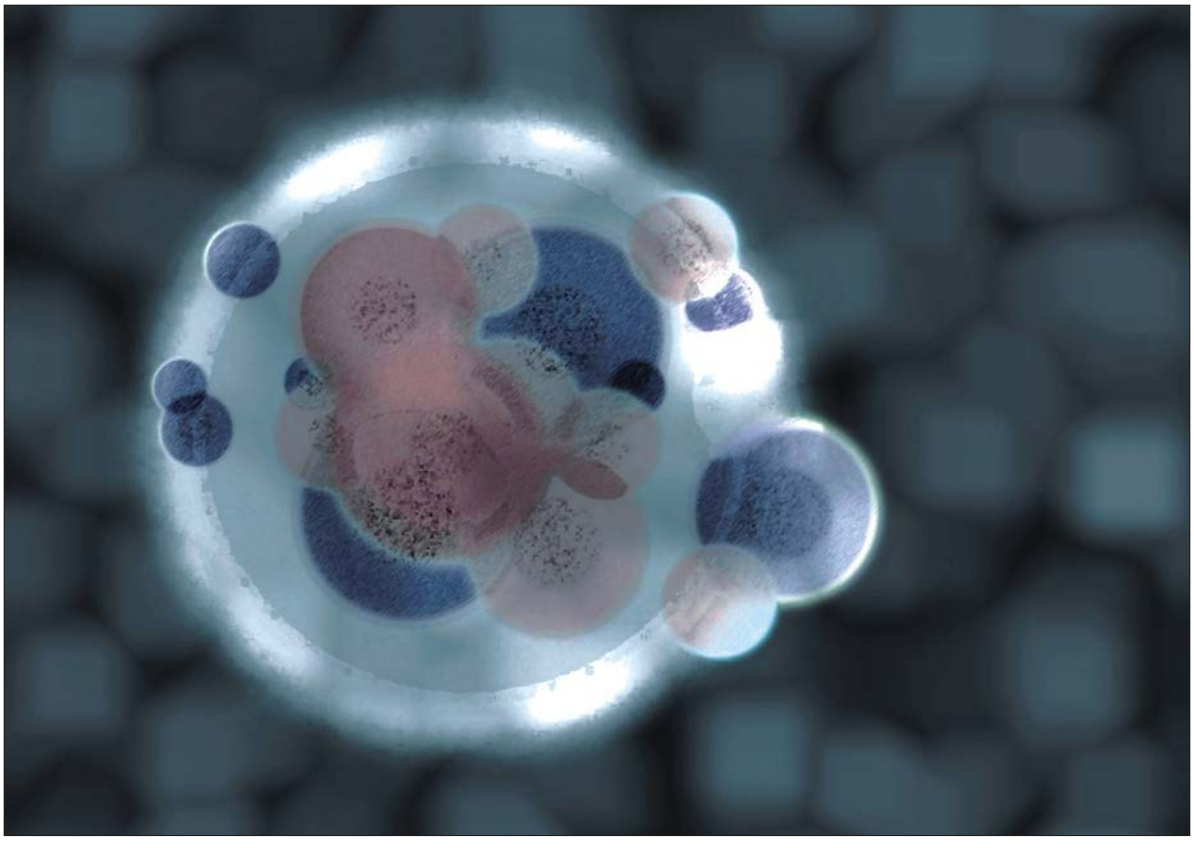

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Growth of Tea Seedlings Affected by Different Levels and Application Methods of NPK and Urea

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Abstract: In this very experiment to find out the effect of NPK and Urea with different levels (4 and 8 2.gm/sqm.) and application methods i.e., broadcast and foliar spray on tea (*Camellia sinensis* L) seedlings in the nursery of National Tea Research Inst. Shinkiari during March to December 1999. Seedling for their plant height (cm), number of leaves, root length and root weight (gms) were observed. In the treatments of T_4 and T_5 Urea at 8 and 4 gm/sq.m (foliar spray) was found significant among each others in plant height, number of leaves, root length and root weight. However number of leaves and root weight were non-significant among each other's. The seedlings treated in T_2 and T_3 by NPK as broadcast at 8 .8 and 4 gm/sq.m for (plant height, root length and root weight) were remained non-significant among each others except number of leaves and root weight respectively. Where as T_1 (control) remained non-significant among all the treatments in all parameters. Urea at 8 and 4 gm/sq.m (foliar spray) showed the best performance in all the parameters statistically.

Key words: Tea (*Camellia sinensis* L.), seedling, fertilizers, methodology, parameters, NWFP, Pakistan

Introduction

Tea (*Camellia sinensis* L) is perennial crop having the life of more than 100-120 years with its normal production. Tea can be propagated either by seed or cuttings. The plant raised from seed is called seedling and from cuttings called clone. The clonal material is the most common practice in all tea growing countries, which takes more than 30 years at least for its identification as clone in one region. Though tea has been initially started from seedling in all over the world. As reported by Waheed *et al.* (1996) that due to the scarcity of clonal material, seedlings are still our need to achieve the goal. They further reported that in Australia, Sri Lanka and China seed is still under use for tea propagation and most of the African countries were initially started from open pollinated seed. Country like "Pakistan" where tea is now in crucial stage of extension, where the material for further propagation in not sufficient to fulfil the farmers demand. It is also noticed that clonal material has difficult to handle in the nursery rather than seedlings, which has more than eight plus points as compare to cuttings. Cuttings took twelve months in the nursery while the seedlings 12 to 18 months with the survival rate of 40 and 80% respectively. Fertilizer are an important part of normal intensive production of tea. Optimum fertilizer applications increased growth of young seedlings. The rooting ability of the cuttings is one of the most severe problem it is therefore acclimatizing of seedling for their healthy growth with the application method and levels of fertilizations in that particular area of plantation is necessary. More over when seedlings are below 15 cm height it is easy to broad cost the fertilizer in the shape of granules, but when it grew up from 15 cm to upwards and have more branches with thick leave's, then it is very difficult to broad cost, than the only method for applying is foliar spry. which is beneficial in later stage of the experiment when the plants become ready for transplanting. Anonymous (1969) reported that do not dig fertilizer in to the soil when the seedlings are 15 cm high, start applying NPK 25:5:5 at 5 g /sqm. after every two months and foliar spray of fertilizer on the plants at 1 liter per 2.5 sqm. Fertilization on young seedlings in the nursery period is to obtain healthy, vigorous and uniform plants, which will be suitable for the field planting. Barua (1990) conducted experiments on "100, 200 and 300 kg N ha^{-1} as urea " and 3 sub-plot treatments (0, 1 and 3% 38. N-serve [a nitrification inhibitor]) and reported that N content of topsoil with shoot was highest in May and 200 kg N ha^{-1} resulted in higher growth compared with the control. Nakayama and Harada (1958) found a significant correlation between the weight of tea seedlings and the weight of roots formed and they reported that for seedlings of equal weight, root weight was correlated with starch content but starch content was not correlated significantly with rooting ability. Venkataramani (1962) studied the effect of ammonium sulphate on shoot length and number of roots in tea plant and founded no effect when applied to potted plant but significant increase in shoot length, number of lateral roots and size of root were obtained with aluminum sulphate applied to the soil surface at 2 g per pot as a dilute solution. Main advantage of seed plant is their wide genetic base as they are produced from the crosses between divergent parents. Because of their hybrid vigour and good root structure had not only longer longevity of life but more adaptable to diverse agro-ecological conditions. The aim of the present study was to determine the different techniques of fertilization for satisfactory growth of tea seedlings in the nursery stage.

Materials and Method

The study was conducted in the nursery of National Tea Research Institute, Shinkiari; during March to December, 1999. Healthy seedlings of 15-cm in length raised in black polythene bags of size 4" x 10" was selected and kept in lines under three replications with RCB design comprising 100 seedlings. Initial pH of bags soil was 5.5. when selected for experiment. The treatments were as under:

T_1 = Control T_2 = NPK 4 gm m^{-2}
T_3 = NPK 8 gm m^{-2} T_4 = Urea 4 gm/ltr m^{-2}
T_5 = Urea 8 gm/ltr m^{-2}

Richards (1967) reported that one oz in 1 gallon of water spray of fertilizers per/sq. yard of nursery area which covered roughly 100 sleeves once and every fortnightly after the

Table 1: Tea seedling response to different fertilizer levels and application method in the nursery

Treatments	Mode of Application	Fertilizers	Plant height (cm)	No. of leaves	Root length(cm)	Root weight (g)
T_1	Nil	Control	2.967 D	2.000 C	3.167 D	1.300 D
T_2	Broad cost	NPK 4 gm/m²	4.267 C	3.000 BC	3.867 C	2.000 C
T_3	Broad cost	NPK 8 gm/m²	4.733 B	3.333 BC	4.133 B	2.200 BC
T_4	Foliar spray	Urea 4 gm/m²	5.967 A	4.333 AB	4.433 A	2.567 AB
T_5	Foliar spray	Urea 8 gm/m²	6.267 A	5.333 A	4.400 A	2.600 A
LSD value at 5%			0.4125	1.575	0.2663	0.3904

Means of the same category followed by different letters are significantly different at 5% level of LSD

rooting and until they are ready for transplanting gave significant results. The fertilizer"Urea" dissolves in tap water and were papered the solution at 4 and 8 gm/ltr i.e., 4 and 8% sprayed on the plant's leaves with the spray pump as per treatments equally after 30 minutes leaves were washed out with tape water due to some expected scorching or damage. The fertilizer NPK was applied in the shape of granules by hand to each seedling according to the treatments, but the care was ensured to protect the seedling from direct fertilization on the plant leaves. All other cultural practices were practiced in the nursery uniformly i.e. weeding, irrigation, protection measures (high and low tunnel) with plastic shade till September/October. The data on four parameters (plant height, No. of leaves, Root length and Fresh root weight) was recorded fortnightly and analyzed statistically using LSD method.

Results and Discussion.

Data recorded on Plant height (cm), Number of leaves, Root growth (length, cm) and Root weights (gms) of tea seedlings are presented in Table 1.

Plant height: Results revealed that different levels i.e., 4 and 8 gms with different methods (broadcast and foliar spray) of Urea and NPK applications had a significant effect on plant height of seedlings during the study period. T_4 (5.967 cm) and T_5 (6.627 cm) were recorded respectively. Both the treatments i.e., T_4 and T_5 remained significant among each other's, while the rest of the treatments were remained non-significant among each others including control. The tea plant recovers very fast from acute nitrogen deficiency and a foliar application of 4% urea solution is recommended at weekly intervals for 2-3 weeks to correct the deficiency. These results are more or less similar with the findings of Venkataramani (1962) who reported that ammonium sulphate have significant effect on shoot length.

Number of leaves: Results indicated that T_5 was significant among all the treatments with 5.333, while T_2 (3.000) and T_3 (3.333) were significant among each others respectively where as T_1 remains non significant among the treatments 4 and 5 respectively. This attributed the co relation between the plant height and numbers of leaves because with the increasing of height the number of leaves was increased. It was also showed the tendency of growth/yield of the plant with relation to the fertilization on the seedling in early stage.

Root length: Similar results was obtained for root length as shown in the Table 1. The T_4 (4.433 cm) and T_5 (4.400 cm) were found significantly at par with each other where as T_1, T_2 and T_3 (3.167, 3.867 and 4.133 cm) were non-significant among each other's. Seedling have tap root system that's why the effect of foliar and broad cost affected not so much statistically. It is noticed that both the treatments with both the application methods for elongation of root length and plant height were remain the same statistically and were founded significant among each other's.

Root weight: Results revealed that the T_3 and T_4 were found significant among each other's (2.200 and 2.567) respectively. Where as T_5 (2.600 grams) remained significant among all the treatments previously recorded. While T_5 and T_4, where as T_4 and T_3 while T_3 and T_2 were remained significant among each other's respectively These results are more are less similar with Nakayama and Harada (1958), who reported that significant co-relation between the weight of the seedling and weight of roots were found.

Conclusions: Urea at 8 gms/sq.m by foliar spray has shown the best performance in the nursery and recommended using urea at 8 gms/sq.m (100 seedlings in each sq.m), in the agro-ecological conditions of District Mansehra, under high shade.

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