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NOTE

Effect of Liming of Tea Seedling (*Camellia sinensis* (L.)O. Kuntze)

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For determination of soil pH in tea seedling a pot experiment was conducted in sandy loom soils in Shahid Islami tea research station of Lahijan. The soils with pH = 3.5 was collected from Gasht in Fuman and mixed with different doses of calcium carbonate to reach the soil pH to T1 = 3.5, T2 = 4, T3 = 4.5, T4 = 5, T5 = 5.5, T6 = 6 base on Foths formula. After 7 months, the soil pH was stabilized and clone 100 was planted in this pots the experiment was conduct in completely randomized block design with 6 treatment and three replications each treatment in each replication consists of two pots with 10 kg of soil. After 7 month the growth parameters such as shoot height, root length and whole plant weight were measured. The result showed that soil pH was not significant on the shoot length and wet weight. But reaction of shoot height in T3 (pH = 4.5) and wet weight in T2 (pH = 4) was more. All treatments in root length was also significant at p = 0.05 with Duncan method and T2, T3, T4 were in first class and T5 and T6 was in second class.

Key Words: Liming, Soil pH, Tea, Shoot height, Root length, Dry weight.

Tea is an important cash crop in the Guilan province, northern of Iran and because of its economic value. Many farmers have replaced their traditional annual and native forest with tea. Whereas tea plantations remain productive for long period, yields tend to decline in the latter years. This drop in productivity is traditionally attributed to natural aging of the plants though there is some speculation that may also reflect a loss of soil quality. Soil acidification is a natural process and occurs at a slow rate during the weathering of soils. Its rate can be accelerated by acid inputs from industry and by acidification from agriculture, horticulture and forestry. The most acidifying systems are those where large amounts of biomass are harvested and removed from the land, where the recycling of nutrients is inefficient and nitrate is allowed to leach form the soil or where ammonium-based fertilizers are used.

As a consequence, rate of acidification in agricultural soils have increased[1] and pH has fallen to value where aluminum and manganese are found in the soil solution at levels which are toxic to plants. Tea requires soil that is more acidic than is suitable for many other crops. The best pH for tea is between 4.5 and 5.5. If the pH level is too high or too low, nutrients can get locked up in the soil and become

unavailable to plants. The soil pH can also influence plant growth by its effect on activity of beneficial microorganisms[2].

One of the factors limiting tea production in some Iranian tea garden is soil acidity; the average pH value of these soils was 3.5-4.5 (Tea Research Center) and liming is commonly needed. The acidic soils of northern Iran are also poor in calcium and magnesium. It is to be expected that liming the soil is necessary in order to profitably tea plantation in acidic soils.

Krishnapillai *et al.*[2] reported that using dolomite as a liming substance on tea soils scientifically decreased amount of available aluminum. Kibria *et al.*[3] found that using CaO and dolomite increased soil acidity and available phosphorus and calcium contents. Also effect of CaO on the yield of tea was higher than dolomite. FeO study was carried out to evaluate of liming on soil reclamination and tea growth in Iran. In this particular stud, the impact of liming on the growth of tea (*Camellia sinesis* (L.)O.Kuntz) was investigated during 7 months green house experiment.

The experiment was established in 2000 at the Shahid Islami Research station of Tea Research institute of Iran, Lahidjan. Surface soil (0-25 cm) was collected from the tea field of Fouman at north of Iran. The soil sample was air-dried after that soil analyzed for properties (Table-1). The experiment was set up as a completely randomized, each treatment had three replications. Soil was amended with six levels of lime as 0, 1.12, 2.25, 3.82, 4.5 and 5.62.

TABLE-1
SOME PHYSICO-CHEMICAL PROPERTIES OF THE SOIL

pH	EC	Clay	Sand	Silt	N	$CaCO_3$	OM	P	K	Ca+Mg	CEC
1:2.5	(dS/m)	(%)						(mg/kg)			(meq/100 g)
3.5	1.4	12.8	69.8	17.4	1.2	<1	4.9	72	100	1.5	

Tea (*Camellia sinensis* (L.) O. Kuntz) root stock of colon 100 Iran was micro propagated from buds during 18 month at sand media. After 18 month, seedling transplanted to polyethylene bag containing 3 kg soil. The pots were irrigated manually as needed (60 % F.C) during the experiment. Supplementary humidity was used to maintain a minimum 75 % of humidity. After 7 month the plants were harvested and plant height, root length and root weight were recorded. The data were subjected to analysis of variance using the ANOVA procedures of the MSTAT-C program.

Impact of liming on soil properties: Liming clearly increased the Ca^{2+} and Mg^{2+} content of the soil (Table-2). The Ca^{2+} and Mg^{2+} levels in the experimental soil were initially lower than the ranges recommended by soil Analysis Service Ltd.[4] but satisfactory values were achieved after liming.

The soil pH after liming with 3.82, 4.5, 5.62 t ha^{-1} were respectively 1, 1.5, 2 units higher than in plots with no liming. Similarly, after liming with 8 or 12 t ha^{-1} in the first year of trials, the pH level increasing during the 7 years of experiment in fine sand soil while at 4 t ha^{-1}, the pH rose only first year and reminds the same during the 7 years. Amounts of P and K were not significantly different between treatments.

TABLE-2
RESULTS OF SOIL ANALYSES AFTER LIMING

Parameter	Liming level (t/ha)					
	0	1.12	2.25	3.82	4.5	5.62
pH	3.5	4.0	4.5	5.0	5.5	6.0
Ca+Mg	1.5	1.7	2.4	3.6	3.8	4.3
K	100	95	103.2	104.3	98.8	101.4
P	72	74.1	74.9	88.5	94.3	96.2

Plant growth parameters: In this experiment, the effect of liming on the height and total plant weight was not significant (Table-3). Both the deficiency and excess of minerals has a negative effect on root growth. The effect of liming on the total length of roots in the soil was significant, but tea roots were longer in unlimed plots, in comparison with some limed plots.

In conclusion, liming of acidic tea soil is able to increase soil pH and availability of some element while the effects of liming on plant growth parameter expect root length is not significant. It suggested that same long time experiments will carry out to determine the best level of lime application in these soils.

TABLE-3
EFFECT OF LIMING ON GROWTH PARAMETER OF TEA SEEDLINGS

S.O.V.	df	MSE		
		Height (cm)	Root length (cm)	Dry weight (g)
Replication	2	24.63^{ns}	33.83^{ns}	435.55^{ns}
Treatment	5	26.71^{ns}	103.69	1498.48^{ns}
Error	10	11.28^{ns}	7.30^{ns}	217.46^{ns}

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