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Effect of Organic Manures and Fertility Levels (NPK) on Leaf Mineral Composition of Ber under Semi-arid Condition

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Abstract
A field experiment was carried out during 2015-2016 to determine the effect of organic manures and fertility levels (NPK) on leaf mineral composition of three year old ber plants. Four levels of organic manures (control, FYM @ 20 kg/plant, vermicompost @ 6 kg/plant and poultry manure @ 8 kg/plant) and five levels of RDF (control, 50% RDF, 75% RDF, 100% RDF and 125% RDF) in Randomized Block Design with three replications to balance fertilizer requirement of ber under semi-arid region of northern India. The application of vermicompost @ 6 kg per plant (M_2) among the different organic manures proved significantly superior over rest of the treatments in respect to leaf nitrogen (2.25 %), phosphorus (0.119 %) and potassium (1.73 %) content, RLWC (64.11 %) and chlorophyll content (1.84 mg/100g). Similarly, results also showed that maximum leaf nitrogen (2.30 %), phosphorus (1.120 %) and potassium (1.79 %) content, RLWC (65.91 %) and chlorophyll content (1.87 mg/100g) were noted with treatment 125 per cent RDF (F_4) which was statistically at par with 100 per cent RDF (F_3) as compared to control, 50 per cent and 75 per cent of RDF.

Keywords: ber, organic manures, fertility levels, leaf minerals

1. Introduction
In India, ber is being cultivated on an area of about 4845 hectares with production of 66,296 metric tonnes (Anonymous, 2014) [1]. Madhya Pradesh, Bihar, Punjab, Haryana, Gujarat and Rajasthan are the major ber growing states. The Indian jujube is grown chiefly for its fruits which may be eaten fresh, dried or canned, smoked and pickled or used in drinks. The leaves are used as nutritious fodder for sheep, goats, cattle and camels. The medicinal value of various parts of the tree and fruits of *Zizyphus sp.* are many and yet not fully exploited. The seeds kernels are aphrodisiac and decoction from root and bark is good for dysentery and diarrhea. Ber tree is important host plant for insect *Laccifer lacca* (Kerr.) which secrets a resinous substance on the twigs which is the raw materials for shellac preparation.

It has a remarkable adaptability enabling it to grow in a wide range of agro-climatic situation and soils (Rana *et al*., 1979) [10]. Integration of organic manures and chemical fertilizers is a system approach in nutrient management especially in semi arid regions emphasizes the need to increase the nutrient use efficiency and economise the use of costly mineral fertilizers by associating for the residual effects of the applied fertilizers. It is well documented that growth and yield of trees are greatly influenced by a wide range of nutrients. The role of nutrient elements either alone or in combination with other sources (organic manures/fertilizers) has been well established in many fruit crops; while such studies are very meagrely available in ber (Katiyar *et al*., 2012) [8].

Keeping the above facts into consideration, an investigation was carried out to identify effect of organic manures and fertility levels (NPK) on leaf mineral composition of ber under semi-arid condition of Northern India.

2. Materials and Methods
The experiment was conducted at Horticulture farm, S.K.N. College of Agriculture, Jobner (Jaipur) during July, 2015 to February, 2016 in the Ber orchard under semi-arid conditions. The plants of uniform size, vigorous and planted at 6 m x 6 m spacing approximately three years age after budding were selected. The experiment consisted of 20 treatment combinations with four levels of organic manures (M_0-control, M_1-FYM @ 20 kg/plant, M_2-vermicompost @ 6 kg/plant and M_3-poultry manure @ 8 kg/plant) and five levels of RDF (F_0-control, F_1-50% RDF, F_2-75% RDF, F_3-100% RDF and F_4-125% RDF) in Randomized Block Design with three replications. The full dose of organic manures was applied as soil application in July, 2015. The recommended doses of fertilizers as 1100 g urea, 1400 g SSP and 200 g MOP per tree were applied. Full dose of SSP, MoP and half dose of urea in various treatments were applied as basal dose in July, 2015. Remaining half dose of urea was applied before flowering. The fertilizers were applied to the top soil around the plant. The fertilizers uniformly mixed into the soil. Irrigation was applied immediately after application of manures and fertilizers.

The methodology for leaf sampling suggested by Bhargava *et al.* (1990) [4] for ber was followed. Composite leaf samples consisting mainly sixth leaf which was approximately 24 days old, either from secondary or tertiary branches were taken at full bloom stage in the month of October, 2015 from experimental plant. The sample size was taken 10 leaves in each sample from tagged branches of the plant from all directions. The physico-chemical parameters of plant *viz.*, nitrogen (Snell and Snell, 1949) [12], phosphorus (Jackson, 1973) [7] and potassium (Bhargava and Raghupathi, 1993) [3], Relative Leaf Water Content (Salvik, 1974) [11] and total chlorophyll content (Arnon, 1949) [2] in

leaves were analyzed in laboratory.

3. Statistical Analysis
To test the significance of variation in the data obtained from analysis of various physic-chemical properties of plant and soil, the technique of statistical analysis of variance was suggested by Fisher (1950) for Randomized Block Design. Significance of difference in the treatment effect was tested through 'F' tests at 5 per cent level of significance and CD (critical difference) was calculated, wherever the results were significant.

4. Results and Discussion
A perusal of data regarding to nitrogen phosphorus and potassium content, relative leaf water content and total chlorophyll content in leaves of experimental plant presented in table-1 had significant effect with application of various organic manures and fertility levels. The maximum nitrogen (2.25 %), phosphorus (0.119 %), potassium (1.73 %), RLWC (64.11 %) and total chlorophyll content (1.84 mg/g) in leaves were observed in treatment M_2 (Vermicompost @ 6 kg/plant) which is significantly superior over rest of the treatments except M_3 (Poultry manure @ 8 kg/plant). All the above parameters of experimental plant were recorded significantly poor under control. It might be due to when vermicompost is added to soil, complex nitrogenous compounds slowly break down and make steady N supply throughout growth period of plant, which might be attributed to more N availability and its subsequent uptake. Phosphorus and potassium uptake also had similar pattern as that of N, which might be attributed to maintain ideal soil pH leading to correct nutrients deficiencies and more solubilization of native phosphate in to available form from the soil due to action of various organic acids liberated during decomposition of vermicompost.

Table 1: Effect of Organic Manures and Fertility Levels (NPK) on NPK, RLWC and total chlorophyll content in leaves of Ber

Treatments	N content (%)	P content (%)	K content (%)	RLWC (%)	Total chlorophyll content (mg/g)
Organic Manures					
M_0 Control	1.96	0.088	1.49	55.28	0.98
M_1 FYM 20 kg/p	2.11	0.105	1.60	60.46	1.19
M_2 VC 6 kg/p	2.25	0.119	1.73	64.11	1.84
M_3 PM 8 kg/p	2.22	0.116	1.69	63.48	1.75
SEm±	0.02	0.002	0.02	1.03	0.04
CD (P=0.05)	0.07	0.007	0.07	2.95	0.11
Fertility Levels					
F_0 Control	1.83	0.086	1.38	53.29	0.80
F_1 50% RDF	2.03	0.101	1.53	57.75	1.20
F_2 75% RDF	2.22	0.111	1.66	61.83	1.53
F_3 100% RDF	2.29	0.118	1.76	65.38	1.80
F_4 125% RDF	2.30	0.120	1.79	65.91	1.87
SEm±	0.03	0.003	0.03	1.15	0.04
CD (P=0.05)	0.07	0.007	0.07	3.33	0.12

The physiological parameters like relative leaf water content and total chlorophyll content in leaves also improved with application of organics which could be attributed due to better root growth and activities resulting in maximum water and nutrient uptake (Gajri and Parihar, 1985) [5]. Both nutrients concentration and their uptake are important parameters for judging the capacity of soil to supply available nutrients.

The maximum NPK content (2.30%, 0.120% & 1.79%, respectively), RLWC (65.91%) and total chlorophyll content (1.87 mg/g) in leaves (Table 1) were recorded maximum under treatment F_4 (125% RDF) closely followed by F_3 (100% RDF). This might be due to the improved translocation of nitrogenous compounds and nutrients from various plant parts, synthesis of common precursor of chlorophyll, ammonia assimilating enzymes etc. The results are conformity with the findings of Giradi and Mourao (2004) [6] in sweet orange and Kumar *et al.* (2005) [9] in guava.

5. Conclusion
On the basis of obtained experimental findings, it can be concluded that among different organic manures application of treatment M_2 (Vermicompost @ 6 kg/plant) gave best results with respect to nitrogen, phosphorus, potassium, RLWC and total chlorophyll content in leaves of ber plant. Similarly, among different fertility levels (NPK) application of treatment F_4 (125% RDF) were recorded maximum in respect to above mentioned parameters.

7. References

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