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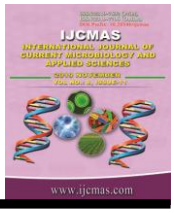

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Evaluation of Soil Properties under the Effect of Organic Mulches in Acid Lime (*Citrus aurantifolia* Swingle)

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A B S T R A C T

An experiment was conducted at Fruit Research Farm, College of Horticulture and Forestry, Pasighat, Arunachal Pradesh to study the effect of organic mulches on soil properties in acid lime using Randomized Block Design. The study revealed that the soil properties were found to be highly significant. The maximum soil moisture content (33.66 %) was observed in dry grasses mulch (T1) while maximum organic carbon (3.11 %), available nitrogen (428.47 kg/ha), available phosphorus (45.17 kg/ha) and potassium (575.06 kg/ha) were observed in saw dust mulch (T**6**) (Table 1). The mulching materials especially paddy straw and rice husk mulch imparted significance increase on the soil microbial population. Paddy straw mulch (T3) recorded highest microbial population of bacteria at 83.45 × 10^5 followed by rice husk mulch (T4) at 74.88 × 10^5 while highest population of fungi was observed in rice husk mulch (T4) at 119.34 × 10^5 followed by paddy straw mulch (T**3**) at 54.77 × 10^5.

Introduction

Acid lime (*Citrus aurantifolia* Swingle) belongs to the family Rutaceae, having a chromosome number of 2n =18 and is considered to be indigenous to India. It is the third important citrus fruit crop in India next to mandarin and sweet orange. The fruit is valued not only for its nutritional qualities but also for pharmaceutical, nutraceutical, cosmeceutical, medicinal and health sector with its great potential growth. Mulching

plays an important role in conservation of soil moisture during dry periods, as well as improves physical, biological and chemical properties of soil. Mulching is a practice, which helps in proper growth and development of the plants by modifying soil temperature, providing better nutrient availability and by better moisture conservation (Kher *et al.*, 2010). Research has shown that organic mulch provides many benefits to crop production through soil and water conservation enhance soil biological activity and improve chemical and physical properties of the soil (Bhardwaj, 2013). Organic mulches add nutrients and humus to the soil as they decompose, improving its tilth and moisture holding capacity (Bakshi *et al.*, 2015) which includes increased mineralization rates, suppress diseases and nutrient cycling (Pinamonti, 1998).

Studies indicate that the addition of organic mulches decreased the fertilizer requirements (Evanylo *et al.*, 2008), decreased soil bulk density, and increased soil carbon and cation exchange capacity (Tiquia *et al.*, 2002).

However, the advantageous effects of the organic mulching materials on soil properties have not been studied in acid lime. Therefore, an evaluation of soil properties was done to find out the effect of locally available organic mulching materials in acid lime.

Materials and Methods

The experiment was carried out on 6 years old acid lime var. PKM 1 planted at spacing of 3m × 3m at Fruit Research Farm, College of Horticulture and Forestry, Central Agricultural University, Pasighat. Arunachal Pradesh.

The experiment consisted of six treatments in a Randomized Block design with three replications. The organic mulching treatments were T_1 = Dry grasses, T_2 = Banana leaves, T_3 = Paddy straw, T_4 = Rice husk, T_5 = Wood shavings and T_6 = Saw dust. The surface (0-15 cm) soil samples were used for analyzing the soil properties. The soil properties were determined using soil analytical methods given by Jackson (1973) as organic carbon content was determined by wet digestion method of Walkley and Black, available nitrogen (N) by Kjeldahl's method, available phosphorous (P) by Bray and Kurtz method and available potassium (K) by flame photometric method. The microbial population of the soil was estimated using serial dilution agar plating method or viable plate count method.

Results and Discussion

The effect of organic mulching materials on soil moisture content, organic carbon, available nitrogen, phosphorus, potassium content and microbial population have been observed showing a significant observation although there was no significant impact on the soil pH. The maximum soil moisture content (33.66 %) was observed in dry grasses mulch (T1) while maximum organic carbon (3.11 %), available nitrogen (428.47 kg/ha), available phosphorus (45.17 kg/ha) and potassium (575.06 kg/ha) were observed in saw dust mulch (T_6) (Table 1). The mulching materials especially paddy straw and rice husk mulch imparted significance increase on the soil microbial population. Paddy straw mulch (T_3) recorded highest microbial population of bacteria at 83.45×10^5 followed by rice husk mulch (T_4) at 74.88×10^5 while highest population of fungi was observed in rice husk mulch (T_4) at 119.34×10^5 followed by paddy straw mulch (T_3) at 54.77×10^5. The available nitrogen in post harvest soils increased successively with increasing nitrogen levels which was due to integration of organic and inorganic sources and also due to increased microbial activity which could have stimulated the nitrification process.

Table.1 Effect of organic mulching materials on soil properties

Treatments	Soil pH	Soil moisture content (%)	Organic carbon (%)	Available nitrogen (kg/ha)	Available phosphorus (kg/ha)	Available potassium (kg/ha)	Microbial population (cfu/g)	
							Bacteria ($\times 10^5$)	Fungi ($\times 10^5$)
T_1	5.37	33.66	2.85	388.80	44.80	511.46	29.42	0.10
T_2	5.41	29.11	2.49	347.10	31.73	482.16	27.36	0
T_3	5.53	30.26	3.03	367.63	41.81	556.92	83.45	54.77
T_4	5.32	28.66	2.94	376.27	42.93	559.35	74.88	119.34
T_5	5.97	26.73	2.76	409.73	38.08	527.86	31.89	0.25
T_6	5.90	29.66	3.11	428.47	45.17	575.06	34.77	0.03
SEd (±)	-	2.99	0.21	33.98	5.96	32.17	1.14	0.18
CD at 5%	N.S	6.34	0.44	72.03	12.65	68.21	2.43	0.38

Among the organic mulches, saw dust mulch (T6) proves to have a profound beneficial effect on the soil properties although the other treatments were in par with T6.

The experimental study concluded that organic mulching materials had significantly influenced moisture conservation, nutrient N:P:K concentration and soil health in acid lime. The moisture regulation is of utmost importance and needs to be emphasized as a priority at critical stages of growth.

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