



Vegetative Growth of Apple Tree As Affected by Manure

KEYWORDS

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ABSTRACT Manures can provide high concentrations of mineral nutrients, especially nitrogen, however the nitrogen of the manure can be lost via volatilization therefore, manures are suitable to groundcover management systems utilizing cultivation. Manures provide multiple nutrients in addition to nitrogen. For example chicken manure is high in phosphorous. The results of using manure are variable due to variation in nutrient content or degree of decomposition. Organic matter is often low in many existing orchard soils, and increasing it improves soil water and nutrient holding capacity which improves root regeneration and tree vigor.

1 Introduction

APPLE (*Malus pumila*) is the most important temperate fruit of the north-western Himalayan region. It is predominantly grown in Jammu and Kashmir, Himachal Pradesh and hills of Uttarakhand, accounting for about 90% of the total production. Its cultivation has also been extended to Arunachal Pradesh, Sikkim, Nagaland, and Meghalaya in north-eastern region and Nilgiri hills in Tamil Nadu. The agro-climatic conditions in these states are not as conducive as in north-western Himalayan region. Early and continuous rains from April onwards do not favour the production of quality fruits besides resulting in high incidence of diseases.

The apple-growing areas in India do not fall in the temperate zone of the world but the

prevailing temperate climate of the region is primarily due to snow covered Himalayan ranges and high altitude which helps meet the chilling requirement during winter season extending from mid-December, to mid March.

CLIMATE AND SOIL

Most of the apple varieties require 1,000-1,500 hours of chilling below 7°C during winter to break the rest period. These conditions are available at an elevation of 1,500-2,700m above mean sea-level in the Himalayan ranges. By and large, the average summer temperature should be around 21°-24°C during active growth period. The areas with frostfree spring and adequate sunshine during summer without wide fluctuations in temperature are most suitable for apple cultivation. Low temperature, rains and cloudy weather, during flowering period hamper the bee activity, affecting cross pollination adversely. Areas

exposed to high winds particularly the hill tops are also not suitable for its cultivation. Dry winds during summer desiccate flowers and hamper bee activity, resulting in poor fruit set in clement weather, particularly low temperature below 15°C during bloom restricts the bee activity which is completely inhibited below 4.4°C, affecting fruit set. Fully opened blossoms may be killed at temperatures below -2.2°C. The optimal temperature for pollen germination and fruit setting is 21.1-26.7°C. Well-distributed rainfall of 100-125cm throughout the growing season is most favourable for its optimal growth and fruitfulness.

The long drought spells during fruit development and ex-

cessive rains and foggy conditions at fruit maturity hamper fruit size and fruit quality. Dry temperate areas suitable for apple cultivation in Himachal Pradesh and Jammu and Kashmir are most suitable for production of high-quality fruits having intense

colour development, high sugar content and longer shelf life. Soil depth, drainage and pH determine the suitability of soil type. Loamy soils, rich in organic matter having a pH of 5.5-6.5 with gentle to moderate slope, proper drainage and good aeration are most suitable. The soil should be free from hard substrata and waterlogged conditions. Where cultivation is done on flat soils, proper drainage channels need to be

developed to restrict the incidence of collar-rot, root-rot and other soil-borne diseases.

VARIETIES

Apple varieties should have climatic adaptability, attractive fruit size, shape, colour, good dessert quality, and long shelf-life, resistance to diseases and pest and tolerance to drought conditions besides high productivity. In fifties, the green English variety McIntosh, Baldwin, Jonathan, Cox's Orange Pippin, Golden Delicious, Black Ben Davis and Pippins-predominated. Of late, the coloured Delicious apples have replaced the English ones. As a result of this phenomenal change, Delicious group occupies more than 83% of the total areas under apple in Himachal Pradesh, 15% in Jammu and Kashmir and 30% in Uttarakhand. In Jammu and Kashmir, the area under Ambri has decreased to less than 1% due to late-bearing of this variety, though the fruits are highly attractive with a long shelf-life.

2 Materials & Methods

The study was conducted on one year old apple trees of cv. Golden delicious grafted on seedling rootstocks, by using manure rates (0, 0.5, 0.7, 1.0 and 1.2 kg/tree) as factor in a split plot experiment at an orchard and received the common horticultural practices. Before beginning of the experiment, manure treatments were carried out by digging a 20 X 30 cm hole with the 15 cm depth and 20 cm distance from the tree at second season before beginning of tree growth. Bud number, trunk diameter, shoot length, tree height and were measured at the beginning and also end of the growth at the second season to determine increasing in vegetative characteristics of the trees.

Table ---. Effect of manure on growth characteristics of apple tree.

manure (kg/tree)	in-creased bud number	in-creased trunk diameter (cm)	in-creased annual shoot length (cm)	in-creased tree height (cm)	in-creased crown diameter (cm)
0	8.17	1.19	10.19	47.58	17.21
0.5	17.17	2.19	19.68	64.17	20.75
0.7	21.25	2.18	27.20	69.58	21.75
1.0	15.58	3.63	29.68	91.67	22.58
1.2	15.67	2.33	19.71	75.15	20.96

manure affected on vegetative growth characteristics (Table). The maximum increase of bud number (21.25) was obtained at 0.7 kg/tree which was significantly different when compared to control (0 kg/tree). The highest increase of trunk diameter (3.63 cm), annual shoot length (29.68 cm), height of the tree (91.67 cm) and crown diameter (22.58 cm) were achieved on 1.0 kg/tree which were not significantly different when compared to 0.5 and 0.7 kg/tree. Poultry manures contain two to three times as much nitrogen, three to five times as much phosphorus and about the same amount of potassium as other farm manures.

3 Result & Discussions 3RESULT AND DISCUSSION

The increasing cost of fertilizers, growing ecological concern and conservation of energy have created

considerable interest in the use of organics as source of plant nutrients as well as to accelerate the activity of microbes in building up soil fertility. Manure technology solely depends on the use of

crop residues, animal manures, green manures, off-farm organic wastes, crop rotation incorporating legumes and biological pest control to maintain soil productivity. Thus the concept of manure farming has created a renewed interest in the use of organic manures. Hence there is urgent need to explore the new sources of suitable manures.

Manure is made from plant waste substances like neem and caster cakes and animal waste material like fishmeal etc. Presently many brands of commercial manures are available in the market. Suitability of these manures in apple production is less known. Thus the present investigations were undertaken to study the effect of manures and farm yard manure (FYM) on apple productivity and soil fertility.

The present results are in accordance with those obtained by El-Morshedy (1997) who found that, chicken manure increased shoot growth rate of sour orange seedlings. manure affected on vegetative growth characteristics (Table). The maximum increase of bud number (21.25) was obtained at 0.7 kg/tree which was significantly different when compared to control (0 kg/tree). The highest increase of trunk diameter (3.63 cm), annual shoot length (29.68 cm), height of the tree (91.67 cm) and crown diameter (22.58 cm) were achieved on 1.0 kg/tree which were not significantly different when compared to 0.5 and 0.7 kg/tree. Poultry manures contain two to three times as much nitrogen, three to five times as much phosphorus and about the same amount of potassium as other farm manures. Fruit characteristics like fruit weight 227.70 length 8.50 breadth 8.4 and yield 69 in apple were recorded maximum under 1.2@ kgmanure. Similar results were also reported by Thanuanathan et al (1997) in

onion, Gupta et al (2000) in rice and wheat, Chaudhary et al (2003) in tomato and Verma and Bhardwaj (2005) in apple with the application of organic materials. Researchers suggested a positive effect of the poultry manure treatments on soil humification (Canali et al., 2004). AL-Kahtani and Ahmed (2012) revealed that the agricultural waste + 10% sheep manure resulted in the highest values of all vegetative growth parameters of olive tree such as leaf length, width and area, shoot length and pigments content. Manures can provide high concentrations of mineral nutrients, especially nitrogen, however the nitrogen of the manure can be lost via volatilization therefore, manures are suitable to groundcover management systems utilizing cultivation.

manure (kg/tree)	Fruit weight (g)	Fruit length (cm)	Fruit breadth (cm)	Fruit yield (kg/tree)
0	201	6.1	5.3	59.0
0.5	217	5.9	7.2	58.9
0.7	220	7.8	7.4	64.4
1.0	221	8.1	8.1	67.5
1.2	227	8.5	8.4	69.3

Fruit characteristics and yield

Fruit characteristics like fruit weight 227.70 length 8.50 breadth 8.4 and yield 69 in apple were recorded maximum under 1.2@ kg manure. Similar results were also reported by Thanuanathan et al (1997) in

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4 Conclusions

Manures provide multiple nutrients in addition to nitrogen. For example manure is high in phosphorous (Schupp and Moran, 2003). The results of using manure are variable due to variation in nutrient content or degree of decomposition. Organic matter is often low in many existing orchard soils, and increasing it improves soil water and nutrient holding capacity which improves root regeneration and tree vigor.

Apple growers need to determine the optimum irrigation frequency and chicken manure rates. There were not significant differences between 0.5-1.0 kg chicken manure/tree regarding the vegetative growth characteristics therefore, 1.2 kg/tree can be recommended as a suitable rate. Investigations clearly indicated that there was improvement in soil moisture availability, soil pH, organic carbon and nutrient status of the soil due to the incorporation of commercial organic manure and FYM in apple orchard. The results further suggested that application of manure could be the best option for getting good yield of quality apple fruits in uttarakhand.

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