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Influence of Nutrient Sprays on Vegetative Characters of Apple under High Density Plantation Variety Gala Redlum

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ABSTRACT: The present investigations were carried on seven years old plants of Apple cv. Gala Redlum grafted on M9-T337 rootstock at experimental orchards, Division of fruit science, SKUAST-K, Shalimar during 2018-2019. Foliar sprays with nutrients consisting of seven treatments T_0(control), T_1(Macarena@1.5 ml/l), T_2 (Plentogrow@4 ml/l), T_3(Cytored@4ml/l), T_4(Macarena+Cytored@1.5+4 ml/l), T_5(Plentigrow+cytored@4 +4 ml/l), T_6(Macarena+Cytored+Plentigrow @ 1.5+4+4 ml/l). The experiments were laid out in a randomized complete block design and replicated thrice. Foliar sprays of nutrients were carried thrice during the season at 50% bloom and one month after first spray and Beginning of fruit color change (2nd week of July). Amongst nutrient sprays, (T_6) combination of (Macarena + Cytored + Plentigrow @ 1.5 + 4 +4 ml/l) recorded highest growth characters in terms of Annual increase in trunk girth, Annual increase in TCSA, Annual incremental tree height, Annual incremental tree spread, Annual extension growth and leaf area. The foliar application is quick method due to which we get instant results because it get directly penetrated to the target part where it is applied.

Keywords: Apple, growth characters, nutrients concentration, Gala Redlum.

INTRODUCTION

Mineral nutrition affects crop production and fruit quality both directly and indirectly (Bravdo *et al*., 2000) and several components of fruit quality of rosaceous species (Habib *et al*., 2000). Mineral nutrition has great influence on tree vigor, flower bud formation, fruit set, fruit drop. Fruit cultivation in marginal areas which are very poor in nutritional status are often prone to nutrient losses either through leaching or draining-off following rain. Even under efficient nutrient management, mineral nutrition even if applied in sufficient quantities become unavailable to plant on such soils due to moisture stress/drought or root system of the tree cannot fully exploit the nutrients applied and this leads to manifestation of various nutrient deficiencies especially of Ca, B and Zn (Feza and Simnani, 2001) which adversely affect the yield and quality of apple. Although, the Kashmir soil have sufficient amount of nutrients but their uptake by the trees is restricted for various reasons viz. adverse soil conditions (acidic, alkaline, saline), drought and antagonism among the various nutrients. Long periods of dry spell often inhibit the uptake of K, Ca, boron and zinc. Fixation of P in acidic/alkaline soils, high nitrogen, calcium content and acidic conditions inhibit potassium uptake. Similarly, boron gets fixed with calcium and soil colloids in high pH soils. Likewise heavy nitrogen application, excess of P and Na (salinity) interfere with zinc uptake (Chadha, 2001). Certain parts of a tree may require more of a particular nutrient than does the entire tree (Faust, 1989). Evidences show that cultural practices and environmental condition have great influence on mineral uptake and their translocation within the plant (Verma, 2001).

The foliar spray is regarded as a credible method to acquire a rapid response to fertilization of fruit trees, especially when soil conditions limit the uptake of elements by the root, or during periods of rapid growth or reproductive growth stages. The main advantage of foliar nutrition is that it can be used under very limited root nutrient uptake conditions (root damage, long

periods of dry weather, and stagnation of water on surface of soil).Furthermore, the degree and rate of nutrient utilization through foliar fertilizers are higher than those through soil fertilizers, particularly at low temperatures (Wojcik, 2002). Additionally this type of fertilization largely contributes to environmental protection by reducing undesirable nutrient leaching from the soil, an accompanying manifestation of most other fertilization types (Dong *et al*., 2005).

MATERIALS AND METHODS

The present investigation on "Influence of nutrient sprays on growth of apple under high density plantation var. Gala Redlum and Fuji zehnAztec" was carried at experimental farm of the division of fruit science at Sher-e-Kashmir University of Agricultural Sciences and Technology of Shalimar campus Kashmir during the year 2018-2019. The selected trees were on M9-T337 rootstock of uniform vigor and age. The experiment comprising of six treatments viz., Control, Macarena @ 1.5 ml/l, Plentigrow@ 4ml/l, Cytored@ 4ml/l, Macarena +cytored@ 1.5 + 4 ml/l, Cytored + Plentigrow @ 4 +4 ml/l and Macarena + cytored+plentigrow @ 1.5 +4+4 ml/l. was laid out in randomized complete design with three replications. The chemicals sprayed were applied at 50% bloom, one month after first spray and beginning of fruit color change (2nd week of July). In order to determine the effects of nutrients at various phonological stages on vegetative growth, the following measurements were taken.

Macarena: N 2.2%, P 0.8%, K 1.0%, Mg 0.30%, S 3.5%, B 0.080%, Co 0.054%, Cu 1.0%, Fe 1.2%, Mn 1.0%, Mo 0.039%, Zn 2.2%

Cytored: N 2%, K 15%, S 1.0%, B 0.015%, Cu 0.14%, Fe 0.20%, Mn 0.15%, Mo 0.0060%, Zn 0.35%

Plentigrow: Ca 9.0%, B 0.75%

Macarena and cytored sprayed at 50% bloom and one month after first spray

Cytored sprayed during Beginning of fruit color change.

Annual increase in trunk girth (cm): It is measured with the help of measuring tape of 30 cm above the graft union during initial and end of growing season and was expressed in cm.

Annual increase in trunk cross sectional area (cm^2): The trunk cross section area was calculated by using the following formula:

$$\text{Trunk cross section area (cm}^2\text{)} = \frac{[\text{Trunk girth}]\ 2}{4\pi}$$

The annual increase in trunk cross section area was worked out during initial and end of growing season and expressed in cm^2

Annual incremental tree height (m): The initial and final growth of tree height was recorded and the mean increment height was calculated.

Annual increase in tree Spread (m): The initial and final plant spread was measured with the help of graduated staff from north –south and east – west directions. The mean of both the directions was taken as the increment spread of the tree and expressed in meters (m)

$$\text{Tree spread} = \frac{\text{East to west spread (m)} + \text{North to south spread (m)}}{2}$$

Annual Extension Growth (cm): The initial and final growth of the four selected main branches was recorded and the mean increment growth was calculated.

Leaf area (cm^2): Leaf area of each sample of twenty five leaves taken from middle shoots of current season growth was measured per tree basis with the help of systronics leaf area meter 211 and average leaf area expressed in cm^2.

RESULTS AND DISCUSSION

The results presented in table 1 revealed that the Annual increase in trunk girth, Annual increase in Trunk cross-sectional area and Annual incremental tree height of Gala Redlum variety of apple trees was significantly affected by treatments during 2018, 2019 and in pooled data respectively. Combination of Macarena +Plentigrow +Cytored @ 1.5 +4 +4 ml/l (T_6) resulted in maximum Annual increase in trunk girth, Annual increase in Trunk cross-sectional area and Annual incremental tree height. The minimum Annual increase in trunk girth, Annual increase in Trunk cross sectional area and Annual incremental tree height was recorded under T_0, control of gala Redlum variety of apple respectively.

The results presented in table 2 revealed that the Annual incremental tree spread, Annual extension growth and leaf area of Gala Redlum variety of apple trees was significantly affected by treatments during 2018, 2019 and in pooled data respectively. Combination of Macarena +Plentigrow +Cytored @ 1.5 +4 +4 ml/l (T_6) resulted in maximum Annual incremental tree spread, Annual extension growth and Leaf area. The minimum Annual incremental tree spread, Annual extension growth and leaf area was recorded under T_0, control of Gala Redlum and variety of apple respectively.

DISCUSSION

Present studies reveal that growth characters of Gala Redlum variety of apple trees including annual increment in Trunk girth, TCSA, tree height, tree spread, Annual extension growth and leaf area were highest in trees sprayed with combined foliar application of (Macarena + Cytored + Plentigrow @ 1.5 +4 + 4 ml/l) and lowest was recorded under control during 2018, 2019 and in pooled data (Table 1 and 2). The highest vegetative growth as a result of combined application of all essential nutrients in proper amount. Further, N is a constituent of essential cellular components such as amino acids, proteins and nuclicacids. It promotes photosynthesis because N increases the amount of chlorophyll is the only substance capable of integrating the growth and

metabolic activity at the cellular level. The role of nitrogen as an osmotic agent, which allows to retain the water in the vacuoles has been considered as important to its nutritional function. K increases the growth because it is an activator of enzymes involved in synthesis of certain peptide bonds during protein synthesis and plays a role in photosynthesis, respiration and translocation of carbohydrates and is essential for chlorophyll development. Increase in growth due to boron could be ascribed to its role in N metabolism, Harmone movement and action and cell division. Further Zn play role in biosynthesis of tryptophan, a precursor of IAA. It was involved in many enzymes in plant metabolism and regulation of water relation in plants. Thus the combined application of these nutrients helps to improve growth of the plants. Similar views have been reported by Kilany and Kilany (1991), Wojcik and Mika, Elshazly and Dris (2004), Javeed (2012), Simnani (2012) and Hajji (2014).

Table 1: Influence of nutrient sprays on growth parameters of Apple under high density plantation var.Gala Redlum.

Parameters / Treatments	Annual increase in trunk girth (cm)			Trunk cross-sectional area (cm^2)			Annual incremental tree height (m)		
	2018	2019	Pooled	2018	2019	Pooled	2018	2019	pooled
T_0 Control	0.430	0.500	0.465	0.014	0.019	0.017	0.403	0.413	0.408
T_1 Macarena	0.540	0.630	0.585	0.023	0.031	0.027	0.460	0.480	0.470
T_2 Plentigrow	0.470	0.530	0.500	0.017	0.022	0.019	0.430	0.440	0.435
T_3 Cytored	0.450	0.520	0.478	0.016	0.021	0.018	0.420	0.430	0.425
T_4 Macarena+Cytored	0.570	0.650	0.610	0.025	0.033	0.029	0.480	0.500	0.490
T_5 Plentigrow+Cytored	0.490	0.540	0.515	0.019	0.023	0.021	0.455	0.470	0.463
T_6 Macarena+Cytored+Plentigrow	0.600	0.730	0.665	0.028	0.042	0.035	0.503	0.520	0.512
C.D ($p<0.05$)	0.030	0.079	0.050	0.003	0.002	0.006	0.024	0.020	0.022

Table 2: Influence of nutrient sprays on growth parameters of Apple under high density plantation var. Gala Redlum.

Parameters / Treatments	Annual increase in tree spread (m)			Annual extension growth (cm)			Leaf area (cm^2)		
	2018	2019	Pooled	2018	2019	Pooled	2018	2019	pooled
T_0 Control	0.090	0.106	0.098	34.110	35.230	34.670	29.257	29.300	29.278
T_1 Macarena	0.153	0.176	0.150	40.640	41.537	41.088	32.643	33.643	33.143
T_2 Plentigrow	0.140	0.153	0.115	37.013	38.010	37.511	31.153	32.126	31.640
T_3 Cytored	0.120	0.133	0.138	36.610	37.163	36.886	32.167	33.093	33.630
T_4 Macarena+Cytored	0.164	0.182	0.170	42.623	43.360	42.991	34.743	35.153	34.948
T_5 Plentigrow+Cytored	0.148	0.158	0.165	39.876	42.870	41.373	34.437	34.930	34.684
T_6 Macarena+Cytored+Plentigrow	0.180	0.226	0.200	43.023	44.676	43.849	37.480	37.857	37.668
C.D ($p<0.05$)	0.016	0.024	0.030	0.034	0.053	0.065	0.555	0.397	0.487

CONCLUSION

The best combination of foliar application of (Macarena + Plentigrow + Cytored) improved growth parameters in Gala Redlum variety of apple. So, the results confirm that foliar nutrient sprays can be useful tool for orchardists to here this objective, to get the quick response of plants in very less time as compared to other methods of fertilizers. Hence the combined foliar application of macro and micro nutrients are recommended to improve the growth characters of plant.

FUTURE SCOPE

The foliar application of both macro and micro nutrients in combination is the best method of fertilizer application because of directly applied and taken up by their target sites and no antigonastic effect are seen through this method.

Conflict of Interest. There are no conflict of interest with any party.

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