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EFFECT OF BIOZYME ON YIELD AND QUALITY OF APPLE

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ABSTRACT

The present investigation was carried out to study the effect of Biozyme granules on yield and fruit quality of the apple. The Biozyme an extract of seaweed is an eco-friendly, non-toxic commercial growth stimulant which influences the plant physiological systems. It is also known to impart resistance against various pests, diseases and climatic stress in plants. Two applications of granules were applied *i.e.* at two weeks before bud break and at walnut stage, at different concentrations (500, 750, 1000 g/tree). The results indicated that higher dose of soil application of said product influenced fruit set, fruit size, TSS, firmness and yield in apple.

Key words : Biozyme granules, Fruit set, Fruit size, Yield.

Introduction

In temperate regions around the world, apple *Malus x domestica* Borkh is considered to be a major fruit crop with significant area under cultivation. The state of Himachal Pradesh is famous for its cultivation of temperate horticultural crops and recognized as the leading apple producer in India with production of 67234 thousand tones in an area of 11516 thousand hectares (Anonymous, 2023). Moreover, there is significant potential for revenue and employment from apple cultivation in the High Mountains of HP. In spite of this, its productivity is low and influenced by several factors such as the insufficient pollination and pollinizer proportion, lack of winter chill, lack of nutrient management, occurrence of biotic and abiotic stress, etc. The fruit crop sector is continuously searching to develop new technologies for improving overall sustainability in production systems with increasing quality and safety. Over the last decade, plant bio stimulants such as humic and fulvic acids, protein hydrolysates, seaweed extracts have become a new and promising production tool that can improve the efficiency of the horticultural inputs. The Biozyme extracted from

a Norwegian Sea weed recognized as *Ascophyllum nodosum* is an ecofriendly (Kumar *et al.*, 2016) and non-toxic commercial growth stimulants which influences the plant physiological system. It contains many growth promoting hormones like auxin, gibberellins, trace elements, vitamins, amino acids and micronutrients and is highly compatible with fertilizers and pesticides. It also has potential to increases the resistance of plants against various pests, diseases and climatic stress (Begam *et al.*, 2020).

Considering its importance, a field trial was formulated and being conducted to study the effect of biozyme fruit plus granule application on yield and quality of apple.

Materials and Methods

The present investigation was carried out to study the effect of Biozyme fruit plus granule application on yield and fruit quality of the apple cv. Oregon spur at Regional Horticultural Research and Training Station, Sharbo (Kinnaur, Himachal Pradesh) during the year 2022. The study site is situated at 2,121.4 meters above

mean sea level and lies between 31° 05' 55" and 32° 5' 20" north latitude and 77° 45' 0" and 79° 10' 50" east longitude. The plants selected for the trials were uniform in size and vigor and also received uniform dose of fertilizers as per university recommendations and the plant protection measure was also similar in all the treatments. The treatments were consisted of soil application of T₁: Biozyme Fruit + G @ 500 g/tree, T₂: Biozyme Fruit + G @ 750 g/tree, T₃: Biozyme Fruit + G @ 1000 g/tree (T₁, T₂, T₃ applied two times; first application at two weeks before bud break and second application at walnut stage), T₄: Biozyme Fruit + G @ 500 g/tree, T₅: Biozyme Fruit + G @ 750 g/tree, T₆: Biozyme Fruit + G @ 1000 g/tree (T₄, T₅, T₆ were applied two weeks before bud break only) T₇: Untreated (control). The experiment was laid out in a randomized block design with three replicates. Fruit samples collected during mid-August were weighed, washed and kept for analysis.

A sample of randomly picked ten fruits per treatment was harvested at commercial maturity for determining of quality attributes. Fruit quality parameters fruit length, diameter, Total Soluble Solids (TSS), firmness was immediately assayed after harvest with specific analytical methods. Three branches on different aspects of the tree were tagged for counting number of flower and fruit set and fruit set was recorded three weeks after petal fall. Fruit length and diameter were measured with Vernier caliper. The TSS content was directly read on Zeis's hand refractometer by putting a drop of fruit juice on prism and reading as Brix° at 20°C (A.O.A.C., 1980). Firmness of flesh was determined by a pressure tester (Magness-Taylor), which recorded the pressure necessary for the plunger to penetrate the flesh. Fruits were harvested during the month of August from each tree and the yield was recorded as kg/tree. The obtained data were tabulated and analyzed under analysis of variance (ANOVA) procedure of statistical analysis system

(SAS).

Results and Discussion

The data pertaining to effect of Biozyme fruit + G on physical parameters is presented in Table 1. It is evident from the data that the maximum fruit set (72.07%) was recorded in treatment (T₅), which was statistically at par with T₂ (70.37%), T₃ (71.39%), T₆ (68.37%) and the minimum fruit set (59.41 %) was recorded in control (T₇). The positive effect on increase in fruit set percentage with application of biozyme may be due to the presence of minerals and some growth regulators, proteins, carbohydrates and vitamins such as thiamine, riboflavin, vit-B12 and folic acid in biozyme. These results obtained are also in close conformity to the findings of Zubair *et al.* (2017), who also reported increment in fruit setting in apple with application of biozyme. Moreover, increasing fruit set and fruit retention might be due to the beneficial effect of biozyme on nutritional status of the trees.

Fruit yield per tree was highest in T₃ (87.32 kg), which was statistically at par with T₂ (79.40 Kg), lowest yield was recorded in control (T₇) (45.85Kg). The increment of apple yield with the application of biozyme granule might be due to optimum absorption of nutrient and other minerals which increase the production and translocation of the food materials from source to sink. Similar results were also obtained by Abada *et al.* (2002) and Fornes *et al.* (2002), who reported increased yield in mango and orange with application of algae and yeast extracts. Notodimedjo (1995) stated that cytokinins present in biozyme are the major factor applied to apple and peach trees in promoting the growth of fruiting spurs and reduce premature dropping of fruit and improve the quality of the fruit.

Fruit size is one of the most important quality parameter. The biozyme fruit plus granules altered fruit length and diameter in apple and found maximum in T₂

Table 1 : Effect of Biozyme on yield and quality parameters of apple.

Treatments	Fruit set (%)	Fruit length (mm)	Fruit diameter (mm)	Fruit yield (kg/tree)	TSS (Brix)	Firmness (Kg/cm ²)
T ₁	64.69	56.16	67.34	62.68	12.41	7.81
T ₂	70.37	66.52	78.13	79.40	13.83	8.73
T ₃	71.39	65.18	77.34	87.32	13.69	8.63
T ₄	60.99	59.37	65.05	41.59	11.56	7.85
T ₅	72.07	58.40	66.45	53.25	11.52	7.56
T ₆	68.37	61.32	70.54	47.31	11.92	7.29
T ₇	59.41	53.30	63.66	45.85	11.18	7.44
CD _{0.05}	5.35	4.50	4.70	8.77	0.81	0.53



Fig. 1 : Effect of Biozyme on fruit set and size of apple.

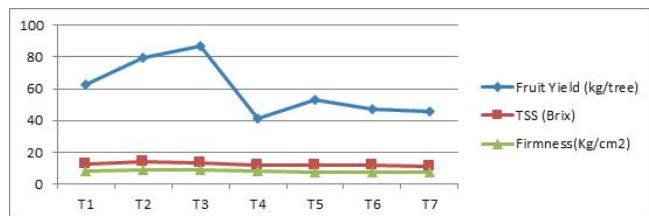


Fig. 2 : Effect of Biozyme on yield and quality parameters of apple.

(66.52 mm and 65.18 mm), which was at par with T₃ (78.13 mm and 77.34 mm). However the minimum fruit length (53.30 mm) and fruit diameter (63.66 mm) was noticed in control (T₇). Same results were found by Sharma *et al.* (2009) and Spinelli *et al.* (2009), who described that application of biozyme increased fruit size in apple trees. Mooney and Van Staden (1986) confirmed that seaweed extracts have macro and micro nutrients, aminoacids, vitamins, and also cytokinins, auxin and ABA like growth substances and that the stimulating effects of seaweed extracts may be attributed to these components, especially cytokinins (Finnie and Van Staden, 1985).

The data on TSS from present investigation revealed that T₂ recorded highest TSS of 13.83 °B, which was statistically at par with T₃ (13.69 °B), lowest TSS was observed in T₇ (Control) (11.18 °B), which was at par with rest of the treatments. Maximum fruit pressure was exhibited by T₂ (8.73 Kg/cm²) which was statistically similar to T₃ (8.63 Kg/cm²), however T₇ recorded minimum fruit pressure (7.44 Kg/cm²). The presence of growth regulators in biozyme may increase fruit firmness degree in fruits. Similar observations were also reported by Mooray *et al.* (2003) and concluded that growth regulators treated fruits were more firm than untreated fruits. Increase in TSS may be related with enzymes which are present in seaweed extract (biozyme) that enhanced the synthesis of different proteins, acids and sugars (Ismail *et al.*, 2003).

Conclusion

Present investigation revealed that soil application of Biozyme Fruit + G at two weeks before bud break and at

the walnut stage of fruit development @ 750 g/tree and @ 1000 g/tree altered fruit set, yield, fruit size, TSS and firmness of Oregon spur apple.

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