

One year old nursery plant



First application of BA at 15 cm new growth



Bud swelling- 15-20 days after spray



Initiation of feathers- 20-25 days after first spray



Initial feathers growth



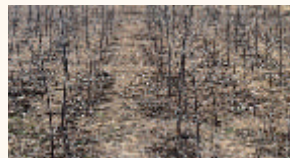
Advancement in feathers growth



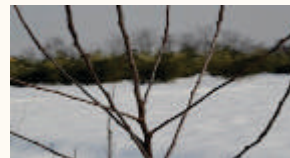
Advancement in feathers growth



Fully developed feathers



Second year nursery cycle- dormant 2 years old feathered nursery plants



Evenly distributed feathers with wide crotch angle



Flowering - during second year



Fruiting - during second year

PRODUCTION OF FEATHERED APPLE NURSERY PLANTS



K.L. Kumawat | Wasim. H. Raja
D.B. Singh | O.C. Sharma
J.I. Mir | Sajad Un Nabi



ICAR-CENTRAL INSTITUTE OF TEMPERATE HORTICULTURE

Old Air Field, P.O. Rangreth, Srinagar-191132
J&K India

Published by

Director, ICAR-Central Institute of Temperate Horticulture,
Old Air Field, Rangreth, Srinagar, J&K

Copyright

©2018 by K.L. Kumawat, W.H. Raja, D.B. Singh, O.C. Sharma,
J.I. Mir and Sajad Un Nabi, ICAR-Central Institute of
Temperate Horticulture, Srinagar, J&K

First Edition: 2019

Introduction

Selection of planting material does not end with choosing right cultivar on right rootstock. Suitable nursery plant must be chosen based on an orchard planting system because the quality of nursery plants has a main impact on the early production and profitability of high density orchards. Now a day's vertical planner orchard planting systems (VPOPS) with conic shaped canopy viz. Tall Spindle, Vertical Axis, Slender Pyramid, SolAxe, HYTEC etc. are dominating systems for apple high density planting throughout the world. These systems are specially designed for apple high density by utilizing high quality feathered nursery plants to ensure early production, which in turn help to cover the substantial increased cost for establishment of high density orchard. However, mostly the planting material produced and sold is un-branched, 60-90 cm, small caliper plant with one-year-old tops which do not suit to the demand of commercial apple orchardists utilizing high density planting system. The country is spending a lot of money for import of feathered nursery plants from other countries. Moreover, being a large canopy size feathered nursery plants are difficult to carry/transport as they require specific care during packaging and transportation. Now with the technological advances it is possible to raise high quality planting material in the country.

Characteristics of an ideal nursery plants

1. Ideal nursery plant should be at least 6 feet tall with dominant straight central leader. Tall nursery plant is beneficial for obtaining high yield efficiency in initial years. Well-developed flower buds on the upper parts of the leader promote yield in the second year and sustain autonomous branching with bourse shoots in the subsequent years. Additionally, tall nursery plant help in acquiring targeted tree height (10 feet at the end of second year) in VPOPSs.
2. The initial large caliper of the nursery plants at planting leads to greater growth and yield in initial 4 to 5 years. At early age of tree, crop load is generally determined by trunk diameter, hence ideal nursery plant should have at least 14 mm trunk diameter at 10 cm above bud/graft union to produce significant yield during second year.
3. It is considered that well feathered nursery plants should have at least 5 to 7 feathers but now a days with

rapid adoption of VPOPS which is completely based on renewal pruning, utilize 10-12 feathered apple nursery plant for planting.

4. Once lateral develop on nursery plant they need to grow a desirable length since feather length and orchard tree productivity are linked positively. Generally feathers less than 10 cm in length are not considered as ideal feathers. For high density planting the feather length of apple nursery plant should be less than 40 cm to reduce branch manipulation after planting.
5. Nursery plants should have feathers with moderate vigor to avoid renewal pruning in early years of orchard establishment. In general at lower part of plants, feather diameter should not be more than 50 per cent of the trunk diameter whereas, at upper part of plants it should not be more than 33 per cent of the trunk diameter.
6. The height of first feather from ground is important determinant of quality of nursery plant. VPOPS in which tying down of lower branches (to manage vigor and induce early high yield) is essential component of system, optimum height of starting feathers is 75-80 cm.
7. Feathers should be distributed along the leader at regular interval.
8. Ideal nursery plants should have feathers with > 45° crotch angle from central leader. Feathers with wide angle form strong union and result in early bloom, higher productivity, balanced vegetative growth, and are easily positioned after planting.
9. Ideal nursery plants should have an abundance of healthy roots to support tree canopy during first year.

Advantage of feathered nursery plants

High quality feathered nursery plants with large caliper and high root volume will quickly establish, grows to desired height and fill their allotted space in orchard and consequently improve total light interception in early life of orchard. Furthermore, feathers form flower buds during first year in orchard and will produce significant yield during second year which will help to cover the cost of establishment. Moreover, early cropping controls

vegetative vigor and consequently results in optimum growth for flowering and fruiting. Additionally, with the use of well-feathered nursery plants, ideal tree canopy can be obtained easily after planting.

Technique for feathered plant production

Plant one year old grafted apple nursery plants of 60-80 cm height during the end of December (prefer) or last week of February at 90 (within row) x 60 (in row) cm spacing. If there are any lateral branches on plant remove them. Spray 600 ppm 6-benzyladenine to produce 6-8 feathers nursery plant and 1000 ppm to produce 10-14 feathers nursery plant during second vegetative growth on the apical section of the central shoot when it produce 12-15 cm new growth in standard type varieties and on 15-20 cm new growth in spur type varieties using hand sprayer until run-off. Apply 3-4 sprays at one week interval in standard/vigorous growing varieties and 4-5 sprays at two week interval in spur/slow growing varieties. Follow routine nursery management like nutrient, water, weed, pest and disease management. In addition, apply two foliar application of urea at 15 days interval starting from first week of September.

Preparation of benzyladenine (BA)

solution: Dissolve required quantity of BA in small quantity of IN NaOH (40 g NaOH in one litre water) and then add required amount of water.

Preparation of ppm (part per million) solution 600 mg in 1 litre = 600 ppm, 1 g in 1 litre = 1000 ppm

Some basic consideration-

- Spray under slow drying condition i.e. late evening or early morning (best temperature- 18-28°C).
- Do not spray on wet foliage.
- Do not spray on un-healthy and stressed plants.
- Ideally there should be no rain at least 6 hr. after BA spray.
- Add 400 µL per litre silicon based adjuvant in spray solution if rainfall predicted.
- Rewetting- within 1-2 days of spray application can increase effectiveness.