13 Maintenance of mother blocks of Citrus rootstocks by farmers and nurseries for production of high-quality planting materials

Indra Pal Singh

GPD ‘passport’

<table>
<thead>
<tr>
<th><strong>GPD code:</strong></th>
<th>04</th>
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<tbody>
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<td><strong>Focus area:</strong></td>
<td>Propagation and planting materials</td>
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<td><strong>Character:</strong></td>
<td>System with techniques</td>
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<td><strong>Species and varieties involved:</strong></td>
<td>Rough lemon (C. jambhiri) and Rangpur lime (C. limonia) rootstock used for raising plants of Nagpur mandarin (C. reticulata) (Plates 19–22)</td>
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<td><strong>Name of location:</strong></td>
<td>Amravati, Maharashtra, India</td>
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<td><strong>GIS reference of location(s):</strong></td>
<td>N 21°27′35″; E 78°13′11″ Elevations: 407 masl</td>
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<td><strong>Name of farmer (source of information):</strong></td>
<td>Mr UdHAV Futane and nursery growers (Village Tiwasaghat, Warud, Amravati) and farmers of Jarud community of Maharashtra, India</td>
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Introduction

The average productivity of Citrus in India is substantially low in spite of the fact that Citrus ranks third amongst fruit crops grown in the country. For Citrus, the availability of high-quality planting material makes all the difference between achieving, or not, a productivity level equal to any of the frontline citrus-growing countries. To get high-yielding, standardized planting material with desired size and traits, it is necessary to raise a nursery of budded, grafted
or layered plants, depending upon their suitability to specific site conditions. Hence, establishment of rootstock foundation seed blocks is important. Extensive surveys undertaken in different parts of the country revealed that most Citrus nurseries do not possess their own foundation blocks either for scion cultivars or for rootstocks.

Nagpur mandarin is a unique mandarin variety grown in Central India in a tropical climate, where the temperature reaches 47°C. No other mandarin is grown at such high temperatures. Its flavour is also unique. Nagpur mandarin is grown mainly in Maharashtra state (Amravati, Nagpur, Wardha and Yavatmal districts) but also in Madhya Pradesh and Rajasthan. As far back as 1977, Nagpur mandarin was reported as one of the best mandarin varieties grown in Central India under the Ponkan mandarin group (Tanaka, 1977). In 2014, the Nagpur mandarin attained Geographic Indication (GI) status from the Government of India due to its uniqueness (GI tag number 385). Nagpur mandarin has a unique blend of acid and sugar that does not exist in any other orange, and it can easily be peeled because of its loose skin. Its taste is very different from other mandarins in the country and it has a unique deep orange colour and a distinct aroma.

Livelihoods in the Vidarbha area of Maharashtra mainly depend on two crops – one is the Nagpur mandarin and the other cotton. Farmers are getting a good income from the sale of this mandarin in Amravati district. Demand for saplings and grafts shows an increasing trend in recent years indicating that farmers are interested in this crop and that the area under Nagpur mandarin is increasing. The livelihoods of about 200,000 families directly depend on it. However, although Citrus gardening contributes almost 50 per cent of the household income of farmers in this area, market linkages are poor and hence the level of income is not very high. The Vidarbha region of Maharashtra has the largest area of Nagpur mandarin production in India (150,000 ha), and more than 9,000,000 plants a year are produced and sold through 325–350 government and private nurseries. Most of the private nurseries are located in and around Shindurjana Ghat, Warud, Amravati, India, which was used for this reason as a project site in the UNEP/GEF project on ‘Conservation and Sustainable Use of Cultivated and Wild Tropical Fruit Diversity: Promoting Sustainable Livelihoods, Food Security and Ecosystem Services’ (see Chapter 1 for information about this project).

**Propagation of Citrus**

Citrus can be propagated through seeds or through budded plants. Propagation of Nagpur mandarin in the Amravati area shifted from seedling to budded plants (onto rootstocks) mainly following the appearance of *Phytophthora* root rot in the Azores Islands in 1842 (Singh and Ghosh, 2000). As the disease was recognized, the interest in rootstocks greatly increased because of the heavy losses experienced. The search for resistant rootstocks started and seedlings were gradually replaced so that today virtually all Citrus trees are propagated by
budding onto rootstock seedlings (Agarwal, 1982). Initially sour orange and rough lemon dominated as resistant rootstocks in citriculture but later, because of susceptibility to Phytophthora and viruses of these rootstocks, screening and development of new rootstocks became a vital citriculture good practice (Arora et al., 2010).

In India, more than 80 per cent of Citrus plants are raised on rough lemon (C. jambhiri), with the rest on other rootstocks such as Rangpur lime (C. limonia) (Plates 19 and 20). No rootstock is immune to Phytophthora; however, location-specific rootstock trials over the last 50 years have given good indications for regionwide use of particular rootstocks (Sonkar et al., 2002; Gupta et al., 2008; Singh, 2011). Much variability exists among the strains of rough lemon and Rangpur lime.

Identification of good practice

During the baseline survey of the UNEP/GEF project at the Amravati site in India, most of the farmers reported an absolute shortage of good-quality planting materials of Citrus. Most of the nurseries procure rootstock seeds from outside states, such as Himachal Pradesh. Many farmers suspected that the rootstock seeds they bought often contained seeds of other non-recommended Citrus rootstock, particularly Galgal (C. pseudolimon) (Plate 21). Use of rootstock from Galgal could lead to large-scale damage in the Citrus industry as, although saplings look vigorous initially, the rootstocks are highly undesirable and affect the quality of the plant and orchard. Erosion of an old practice of maintaining some rootstocks in every orchard or nursery has left the Citrus industry in bad shape. Nevertheless, some progressive growers, like Mr Udhav Futane, continue to maintain mother blocks in Warud and surrounding areas (Plates 23–25). This practice helps such farmers to produce healthy and reliable saplings and grafts for raising Citrus orchards. However, their capacity to produce grafts is low – they can produce only 100,000 to 200,000 plants per year against the demand of about 9,000,000 grafted saplings of Nagpur mandarin (Plate 22). The revival of the old and good practice of maintaining mother blocks of Citrus rootstocks by nurseries and farmers for high-quality planting materials is important for the future of the Citrus industry in the Vidarba region as well in other regions of Maharashtra and in other states where the area under Nagpur mandarin cultivation is increasing. This good practice can save globally important and economically valuable Nagpur mandarin, an important Citrus genetic resource, and uplift mandarin-based livelihoods.

Impact on diversity

The Nagpur mandarin grown in the region is fairly uniform and does not have much diversity in terms of varieties. However, without proper rootstock, there is a danger of its cultivation being abandoned in favour of more remunerative new crops, thus resulting in its erosion as a globally important
Citrus variety. In this context, if the old practice of maintaining mother blocks is reinstated, farmers will be able to maintain at least three species (C. jambhiri, C. limonia and C. reticulata) in their orchards and increase orchard lifespans (Hom et al., 2012).

Impact on livelihoods

The best management practices will culminate in reduced use of Galgal as rootstock. Farmers note that Nagpur mandarin on Galgal rootstock has a much shorter lifespan and it has been observed that orchards using Galgal as rootstock have declined faster. This decline and shorter lifespan of trees adversely affects the livelihoods of the farmers. With better rootstock, nurseries will be able to provide the best quality budlings (budded plants) on recommended genuine rootstock, which are more vigorous with longer lifespans and are less affected by Phytophthora-induced diseases. This should lead to reduced production and replanting costs, eventually generating more income and improved livelihoods. Farmers will get regular income as a result of the sustainability of orchard lifespan.

Assessment of GPD

Sustainable livelihood strategies and outcomes

Farmers can benefit by deriving additional income from raising rootstock seedlings (INR2,000–2,500 per kg seed i.e. US$30–40) in addition to what they save by avoiding purchase from commercial nurseries of the budlings required for their own use. Many nurseries that are being established require labour and this has led to the employment of local tribal inhabitants, thus creating some employment opportunities to earn livelihoods.

At the household level, human assets include the size of family (as labour), their health to work in the field and their ability to use knowledge and skills for capitalizing Citrus diversity. These human assets are considered a building block for achieving livelihood outcomes. Raising community awareness of the threat to the Citrus industry of using the wrong rootstock with the consequence of uniformity of Citrus diversity in the production system is essential for enhancing human capital. Citrus farmers and nursery experts are keen to take the initiative to: (1) identify mother plants of Rangpur lime and rough lemon and maintain blocks of 10 to 15 trees in orchards to produce enough seed to supply nursery experts; (2) enhance farmers’ skills and knowledge to be able to distinguish between Nagpur mandarin budded onto Rangpur lime and that budded onto Galgal rootstocks; (3) identify three or four key nursery experts to promote these techniques through policy support or local recognition. This requires strengthened social capital such as local institutions (e.g. Maharashtra Orange Association of cooperatives and women’s groups) that provide support, and monitor and regulate at the local level. These key nursery experts should
be encouraged not only to maintain mother tree blocks (a small portion of an orchard) to ensure access to rootstock seed locally and supplement income, but also to train other people to develop budwood onto the appropriate rootstock. These farmers might need financial support from Community Biodiversity Management (CBM) funds (see Chapter 3) or from the National Bank for Agricultural and Rural Development (NBARD) to improve the physical facilities of nurseries. These strategies need to be refined as local teams gain experience whilst working with communities and rural institutions. Action plans should be developed using principles of CBM and mobilizing the livelihood assets of local communities based upon their comparative advantages.

**Effect on vulnerability**

A single cultivar, Nagpur mandarin, is the main source of income and livelihoods in Amravati communities. The uniformity of *Citrus* diversity (richness = 3 to 4, evenness = 0.02 to 0.06 and community divergence = 0.08 to 0.27) (Jarvis *et al.*, 2008), use of inappropriate rootstocks and a monoculture production system are the major threats to local livelihoods. Diversity, measured in terms of evenness and community divergence, is worryingly low and threatens to cause shocks to the livelihoods of 1,500 households in the study area alone. Orchards established using inappropriate rootstocks are vulnerable to rapid decline of the orchard caused by multiple disease complexes. In recent years the frequency of orchard decline and the sale of dead trees for fuelwood is a common sight; in their place, cotton is being planted along with other kinds of fruits and trees. One main cause of this is the unwise use of Galgal rootstocks for Nagpur mandarin.

**Factors favouring or hindering successful functioning of GPD**

For a farmer, it is easy to maintain a few plants of a rootstock in the periphery of his or her orchard and sell genuine rootstock seed to nurseries. The successful implementation of this practice might be hindered if the nurseries cannot provide competitive incentives to rootstock seed producers or cannot maintain quality control and supervision in a transparent manner. Supportive policies and regulatory monitoring are needed to improve access to rootstock seeds by farmers and nursery experts. Mr Vasant Madhav Rao Wankhade is a custodian farmer and self-made nursery expert who has developed this idea and is supporting citrus nurseries to introduce effective monitoring and quality control systems (Sthapit *et al.*, 2013).

**Action plan for scaling up and dissemination**

Any action plan drawn up for scaling up needs to be tested in farmers’ fields in consultation with local service providers and farmers together. An awareness-
raising programme for using genuine rootstock will help in scaling up and
dissemination. Such an initiative has already been taken by the National
Research Centre for Citrus (NRCC) Nagpur. Furthermore, a good practice
workshop on ‘Identification of Citrus Rootstock, Mother Block Development
and Production of Quality Planting Materials of Citrus’ was organized in May
2011 at Shendurjanaghath, Warud, Amravati (Singh et al., 2014). Another one-
day awareness programme on ‘Accreditation and Rating of Horticulture
Nurseries of Maharashtra with Special Reference to Fruit Crops’ was jointly
organized by NRCC Nagpur and the National Horticulture Board (NHB) in
collaboration with the Directorate of Horticulture, Government of Maharashtra
in August 2011 at NRCC Nagpur. With the help of the Directorate of
Horticulture, Government of Maharashtra, a large-scale campaign needs to be
undertaken to make it mandatory for every nursery expert to maintain genuine
mother plants of rootstock. The Director of Horticulture, Government of
Maharashtra has already taken an initiative in this direction to maintain mother
blocks of rootstock and scions by nurseries in Maharashtra.

Because Vidarbha is famous for Nagpur mandarin production, the livelihoods
of farmers depend on mandarin production on a sustained basis. The
continuation and improvement of this good practice of producing reliable and
recommended rootstocks will have great impact on the economy of the region
and at the same time help in the continued cultivation of the globally important
Nagpur mandarin.

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