

ICAR-All India Coordinated Research Project on Arid Zone Fruits, Bikaner

Significant achievements Since 2014

(I) Achievements

- The pomegranate variety released under AICRP-AZF Bhagwa by the Rahuri centre revolutionized pomegranate cultivation in the country. It occupied more than 86% of area and 88% of total pomegranate production. Out of the total export of pomegranate (49,760 tonnes/year), about 39,808 tonnes/year alone comes from cultivar Bhagwa, which fetched ₹ 597.12 crore/annum of foreign exchange to the country. After the release of cultivar Bhagwa, there is an increase of 121.43% in area, 279.09% in production, 70.55% in productivity and 381.42% in the export quantity of pomegranate in India. Thus, according to an estimate, cultivar Bhagwa alone is contributing ₹ 8220.12 crore/annum to the national GDP



Pomegranate –Bhagwa

- In ber, trait specific germplasm BS-1 and BS-2 (resistant to fruit fly and powdery mildew); Rohtak Safeda (resistant to powdery mildew) were registered with NBPGR, New Delhi.
- **Phule Bhagwa Super:** It has very attractive dark saffron rind colour with glossiness on the rind surface, bold arils, deep red aril colour, soft seed, sweet with medium fruits and high yielding capacity (171.40 q/ha). It matures in 175-180 days. It is suitable for both export and domestic market.



Pomegranate variety- Phule Bhagwa Super

- **Ananta Rudhira:** The tree form is rounded, drooping at the ends. The pulp texture is firm, peculiar blood red pulp (unripe), reddish brown (ripe) and sweet and acidic in taste. The variety is moderate to heavy regular bearer. The yield potential is 131.83 kg/plant with 43.3%

pulp recovery. It is notified in The Gazette of India by Central Seed Committee under Section 5 of the Seed Act, 1966 (54 of 1966) by the Central Govt. of India on 20th July 2022.



Tamarind - Ananta Rudhira

• **Thettu Amalika:** It is heavy yielder with regular bearing habit. Pods are big, broad, slightly curved with rounded ends and somewhat compressed. The pulp is firm, soft, thick and blackish brown. It is also notified in The Gazette of India by Central Seed Committee under Section 5 of the Seed Act, 1966 (54 of 1966) by the Central Govt. of India on 20th July 2022.



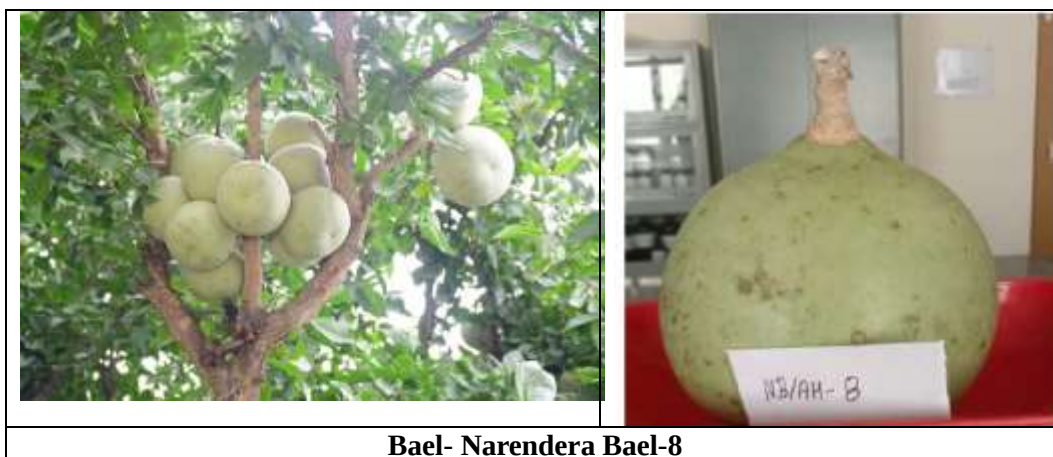
Tamarind - Thettu Amalika

• **Karan Lasoda:** The most peculiar character is dual-time fruiting i.e. April-May and off-season fruiting in winter. The fruits are bigger in size with a pulp stone ratio of 16.48 and fruit quality is good for making pickle. After drying the fruit pulp recovery is 17.32 %. The average fruit yield is 80-90 kg/plant.



Tamarind - Thettu Amalika

• **Narendera Bael-8:** It is a late-ripening variety and fruits have very less fibre, pale yellow pulp, TSS 38.77 °Brix and less mucilage content. The average fruit weight is 1.23 kg with an average yield of 108.89 kg/plant.



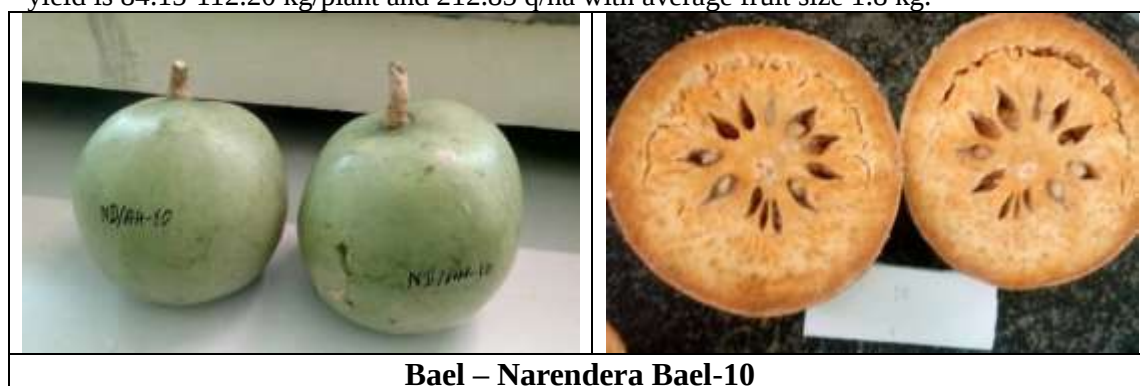
Bael- Narendera Bael-8

- **Narendera Bael-11:** It is early ripening variety suitable for processing. Fruits have whitish yellow pulp with less mucilage content, TSS 33.98°Brix and ascorbic acid 35.15 mg/100 g of pulp. Fruits weight is 1.87 kg with an average yield of 99.60 kg/plant.



Bael – Narendera Bael-11

- **Narendera Bael-10:** It is early ripening (March) and the earliest among the released varieties. The attractive light yellow colour of pulp of completely ripened fruit. It is highly suitable for powder and RTS owing to its attractive pulp colour and fiber content. Average yield is 84.15-112.20 kg/plant and 212.85 q/ha with average fruit size 1.8 kg.



Bael – Narendera Bael-10

- **Narendra Aonla-25:** It is early ripening (November) and earliest among the released varieties. The attractive creamy yellow colour of pulp of completely ripened fruit, fruit shape- flattened round. It has average yield/plant, 34.73 kg/plant, fruit weight 52.76 g and vitamin C-

545.93 mg / 100 g pulp.



Aonla: Narendra Aonla-25

- **Narendra Aonla-26:** It has attractive bright green-yellow colour fruits with a smooth thin skin of completely ripened fruits and fruit shape flattened round. It has yield/plant is 55.56 kg, fruit weight 45.68 g and vitamin C 483.68 mg /100 g pulp.



Aonla: Narendra Aonla-26

- **Phule Janaki:** This custard apple variety has large fruits size (392.71 g). The fruit surface is rough with a yellowish-green colour. Fruit shape is oval and areoles are mammal in shape. Pulp milky white and soft texture with fewer seeds and higher pulp (58.96%). Higher yield (20.69 kg/tree, 55.07 q/ha) and TSS (25.54 %).



Custard apple- Phule Janaki

- **Integrated Nutrient Management in custard apple:** Application of 250:125:125 g N:P₂O₅:K₂O + 6 kg Vermicompost per plant (50 % N with full dose of P₂O₅ and K₂O at the time of bahar and remaining 50 % N one month after bahar) for fully grown custard apple plant is recommended for obtaining higher yield and monetary benefits (B:C ratio 4.43) in custard apple growing area of Maharashtra.
- **Integrated nutrient management in custard apple cv. Arka Sahan:** 25% replacement of RDF with chemical fertilizers is feasible with the application of 100g Bio-fertilizer Consortium consisting of 109 to 1010 CFU/g of *Azotobacter tropicalis*, *Bacillus aryabhatai*

and *Pseudomonas taiwanensis*) + 100g AM fungi (Mixture of three *Glomus* spp @ 100 spores / g of substrate) incubated in 10 kg FYM for 48 hours per plant without affecting fruit yield and fruit quality.

- **Integrated nutrient management in bael:** Application of 50kg FYM + 100% NPK + 200g each (Azotobacter + PSB) can result in fruit yield of 127.93 kg per plant which was significantly superior (58 % higher) to control and is recommended for commercial cultivation of bael under eastern UP conditions.
- **Integrated nutrient management in aonla:** In Aonla , cv. NA-7, recommended dose of nitrogen (500 g/plant) should be applied through inorganic (50%) + FYM (25%) + Neem cake: (25%) to maintain sustainability and to receive higher yield (8.13 % over control) and net income.
- **Integrated nutrient management in date palm:** Supplementations of integrated nutrients N @ 750 g+ 125g P + 125g K with 50 g S and Biofertilizer (125 g Azotobacter + 50 g PSB) along with 40 kg FYM per plant gave maximum yield (64.90% over control) and fruit quality in date palm crop under hot arid zone of Rajasthan conditions.
- **Standardization of NPK dose for fig cv. Poona fig:** The application of 1125 g N, 325 g P₂O₅ and 415 g K₂O per plant was recorded significantly highest number of fruits (331.55, 302.00, and 299.98) and yield (14.62 kg, 13.45 kg & 13.39 kg) per plant, respectively in fig. cv. Poona fig and their interaction effect recorded 357.83 number of fruits and yield 15.72 kg with B:C ratio 2.54.
- **Integrated nutrient management in fig cv. Poona Fig:** In fig cv. Poona fig application of 900 g N + 250 g P₂O₅ + 275 g K₂O + 50 kg FYM/tree) should be done to maintain sustainability and to receive maximum yield (16.15 % higher than control).
- **Integrated management of root-rot (*Fusarium solani*) and root borer (*Emmalocera Depressella*) in bael :** It is recommended that two applications of carbendazim 50 WP (20 g/tree) + chlorpyrifos 20 EC (50 ml/tree) at the time of manuring and repeated after 15-20 days interval is most effective (B:C ratio 6.21 as compared to 2.47 in control) for control of root rot and root borer in bael.
- **Standardization of High Density Planting in bael:** High density plantation (8 x5 m) in bael cv. NB-5 for better yield (60.38 % higher over control 8 x8 m) and returns under Haryana condition.
- **Management of thrips in pomegranate:** Two sprays of neem oil plus karanj oil each(1:1) @ 20 ml with sticker 2 ml per 10 lit. of water at an interval of 10 days is recommended for the effective control (B:C ratio 1.76 against 1.13 in control) of thrips at 50% flowering and fruiting stage on pomegranate.
- **Management of mealy bug in custard apple:** It is recommended that, the strategic four sprays with buprofezin 1.5 ml followed by *B. bassiana* @ 6.0 g followed by Azadirachtin 10,000 ppm @ 3.0 ml followed by *V. lecanii* @ 6.0 g + 5 ml cow milk per lit of water at an interval; of 10 days can be considered as most effective (B:C ratio 3.12 compared to 2.1 in control) for the mealy bug management on custard apple.
- **Management of date palm scale *Parlatoria blanchardi*:** Two successive sprays of Profenophos @1.0ml/l at an interval of 15 days is recommended for the control of scale insect on date palm (5.15 mean insect population as compared to 11.86 in control).
- **Cost effective control of ber powdery mildew:** It is recommended that three sprays of either Carbendazim 50% WP (0.1%). (ICBR 1: 20.73) @ 3.3gm/litre or Tebuconazole 25.9EC (0.1%) (ICBR 1:8.77) @ 3.86 ml/litre or Tebuconazole 50 % + Trifloxystrobin 25% 75 WP (0.05%) (ICBR 1:6.71) @ 0.67gm/litre starting from the initiation of the disease at 15 days interval for effective and economical management of powdery mildew of ber
- **Management of leaf spot of lasoda (*Cordia myxa*):** Alternaria leaf spot of *Cordia myxa* can be controlled by two foliar sprays of tebuconazole 50%+ trifloxystrobin 25% (75 WG)

(@ 1 g/litre) at 20 days interval starting from disease (Jobner centre) or from disease initiation (April to June) which reducing disease intensity (80.10%) and in increasing fruit yield (68.07%) over check with higher B:C ratio (3.28).

- **Management of fig rust:** For effective management of fig rust it is recommended to give three sprays of either Carbendazim 50% WP @ (0.1%). (ICBR 1: 20.73) @ 3.3g/litre or Tebuconazole 25.9EC (0.1%) (ICBR 1:8.77) @ 3.86 ml/litre or Tebuconazole 50 % + Trifloxystrobin 25% WG @ (0.05%). (ICBR 1 : 6.71) @ 0.67 g/litre starting from the initiation of the disease at 15 days interval for effective and economical management of powdery mildew of ber.
- **Management of black leaf spot of ber:** Two foliar sprays of propiconazole (0.1%) was found effective against black leaf spot of ber caused by *Isariopsis indica* which recorded 4.2 PDI compared to other treatment and untreated control which recorded 36.6 PDI of black leaf spot disease in ber. The recommended spray found most cost effective (1:6.6 BC ratio) compared to other treatment and control.
- **Management of Alternaria fruit rot in ber :** Two pre harvest sprays of 0.25 per cent copper oxy chloride at 15 days interval at marble stage of ber fruit was found effective against Alternaria fruit rot which recorded 3.7 PDI followed by Thiophanate Methyl (0.1 %) and Mancozeb (0.2 %) which recorded 5.3 PDI and 6.5 PDI respectively compared to untreated control (32.7 PDI).
- **Management of powdery mildew in tamarind:** Two foliar sprays of carbendazim (0.1%) is found effective in controlling powdery mildew in tamarind caused by *Oidium erysiphoides* which recorded 7.8 PDI compared to un treated control (41.5 PDI).
- **Management of pomegranate die-back (wilt):** Carbendazim 0.1% drenching in soil@ 10 liter/tree followed by soil application of *Trichoderma viride* @ 50g mixed in 5 kg FYM/tree one week after carbendazim drenching is recommended (12.34 % disease incidence compared to 54.32 % in control) for die-back management in pomegranate caused by *Fusarium oxysporum*.
- **Inter-cropping in Date palm:** For Rabi season wheat and gram and for Kharif season moong and guar were sown as intercrop in date palm under Punjab condition. The maximum net returns was recorded in crop rotation of Date wheat and moong crop in date palm of Rs.3,36,756 /ha compared to date palm alone (Rs. 2,22,131).
- **Effect of post-harvest treatment on fungal rot incidence in ber, aonla and custard apple fruits :** Post harvest dipping of ber, aonla and custard apple fruits in 2 per cent sodium chloride solution for 10 minutes recorded the least post harvest fungal rot incidence respectively in ber (4.2 PDI), aonla (3.9 PDI) and custard apple (3.4 PDI) compared to untreated control which recorded 25.1, 27.4 and 20 PDI in ber, aonla and custard apple respectively,
- **Rust disease in Aonla:** Fifteen different models were tested for spray prediction on conducive days. Two resampling techniques, random over sampling (ROS) and synthetic minority oversampling technique (SMOTE) have been used to balance the dataset and five different classifiers: support vector machine (SVM), logistic regression (LR), k-nearest neighbor (kNN), decision tree (DT) and random forest (RF) have been used to classify a particular day based on weather conditions as conducive or non-conducive. The proposed model SMOTE-RF performs best among all models with 94.6% accuracy and can be used in a real time application for spray prediction. Hence, timely fungicide spray prediction without over spraying can help in better productivity and will prevent the yield loss due to rust disease in Aonla crop.