

**ANNUAL ABRIDGE REPORT**  
**FOR THE YEAR**  
**2017-18**

**DIRECTORATE OF HORTIULTURE**  
**AYUB AGRICULTURAL RESEARCH INSTITUTE,**  
**FAISALABAD**



## Horticultural Research Institute, Faisalabad

<b>Javaid Iqbal</b> Director	+92-041-9201690	+92-041-9201817	+92-300-6685394	<a href="mailto:directorhri.aari@gmail.com">directorhri.aari@gmail.com</a>
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### A. OVERVIEW

Pakistan has been blessed with diversified climatic conditions by nature, which support successful growth of about 30 different types of fruit crops. In 2015-16, total fruit production of the country from different crops was 65,67,286 tonnes harvested from 8,04,503 hectares. Punjab province with better horticulture industry development programs under “**Punjab Growth Strategy**” and having improved infrastructure has been imparted a pragmatic contribution for sector development on sustainable basis. Share of the Punjab province is 47% for total area under cultivation of fruit crops, while 67% for fruits production when compared to that of Pakistan. In Punjab, about 20 different types of fruit crops have been cultivated in 2015-16 on 3,81,676 hectares, which produced 43,68,125 tonnes of fruits. Citrus, mango and guava are major fruit crops being cultivated in the province with share of 97%, 92% and 79% respectively in national production of these fruit crops. Among minor fruit crops i.e., jamun, phalsa and ber, respective share of the Punjab province compared to national production of these fruits is 90%, 57% and 35%. Directorate of Horticulture under the auspices of Ayub Agriculture Research Institute has been strived for strengthening of focused research activities for major and minor fruit crops to improve sustainable fruit production in the province. As an organization, Horticultural Research Institute has continued to deliver another year of endeavors for developing research based comprehensive solutions of problems related to orchard management. These research oriented investments have been driven by organization’s professional commitment, dedication of research

scientists for engaging with industrial stakeholders as well as getting consultation directly from fruit growers to prioritize the potential of different research avenues. Establishment of Horticulture Research and Development Board is another milestone to spur sector development and collective vision of experts from research, industry and academia has enabled us to be better responsive to industry and farmers' needs. This innovative, interactive and advisory model involving all stakeholders has proved to be agile in concentrating joint efforts for fruit industry development in the country. It is an honor that the institute has also accomplished innovative approach for diversification to high value cropping in horticulture sector, which coupled with international high end market access, ensures socio-economic development of fruit growers and stakeholders as well as bringing huge foreign revenue.

## **B. RESULTS OF EXPERIMENTS**

### **HORTICULTURAL RESEARCH INSTITUTE, FAISALABAD**

#### **a) Guava**

##### **1. Suitable time for rooting of guava soft wood cuttings treated with Indole butyric acid (IBA)**

Guava is commercially propagated through seeds which results in segregation of valuable genetic characteristics. Clonal propagation through cuttings is highly desirable, yet success depends upon various factors i.e. age of cuttings, part of plant used (softwood & hardwood), propagation time, media used and treatment with growth regulators etc. Present study was carried out to find the best planting time (February, March, August, September) for survival and root induction of IBA treated (0.2%, 0.4%, 0.6%) guava softwood cuttings (GSWCs). Cuttings (15 cm long) having 4-5 nodes with healthy leaves were taken from current season growth of five-ten years old guava plant (var. *Gola*). Treatment of cuttings with 0.4% IBA and plantation during September showed highest survival percentage (59.5%) (*Fig-1*), increase in branch length (15.1 cm) (*Fig-2*) and number of leaves per plant (29.3) recorded after 60 days (*Fig-3*). Highest number of roots per plant (28.0) recorded at transplantation stage (90 days from planting) was also found for this treatment and time (*Fig-4*). Untreated cuttings planted in March showed least success percentage (7.0%), increase in branch length (3.1 cm), number of leaves (6.0) and number of roots per plant (10.0). The study validated the potential of clonal

propagation of guava through softwood cuttings to preserve genetic purity and productive traits. Therefore, it is recommended to treat guava softwood cuttings with 0.4% IBA (4000 mg per liter of water) and plant during September to get better results.

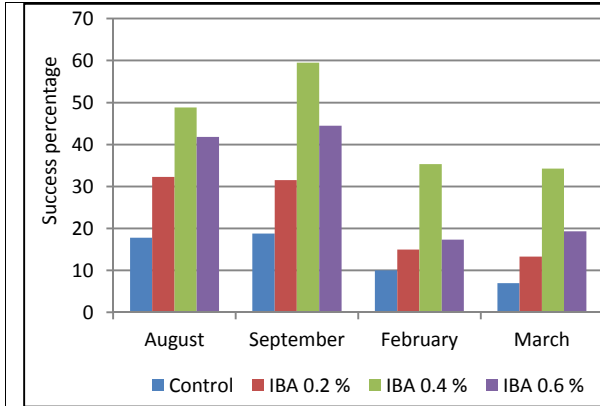


Fig-1: Effect of IBA on success percentage of GSWCs

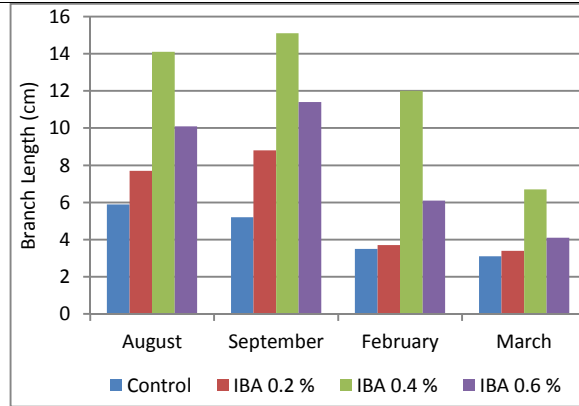


Fig-2: Effect of IBA on branch length (cm) of GSWCs (60 days of plantation)

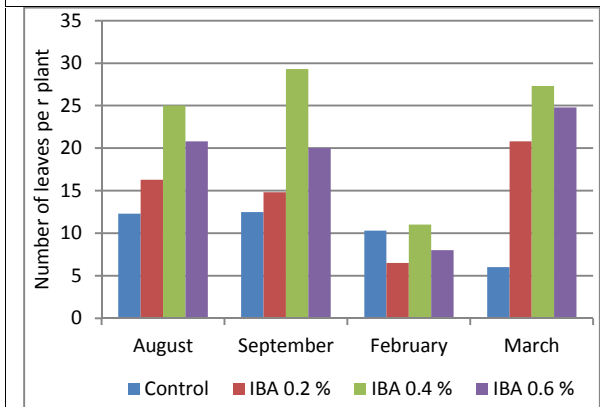


Fig-3: Effect of IBA on number of leaves per plant of GSWCs (60 days of plantation)

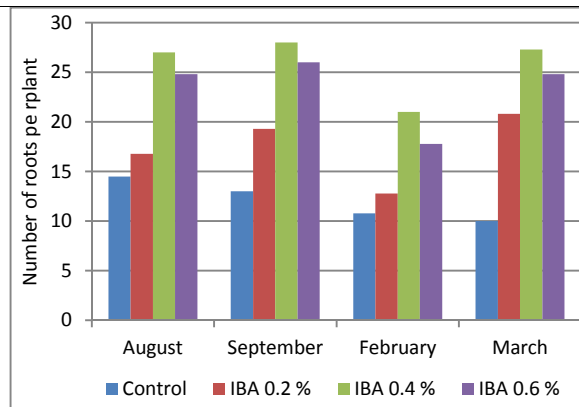


Fig-4: Effect of IBA on number of roots per plant of GSWCs (90 days of plantation)



Guava soft wood cuttings



Plantation under polythene tunnel



## 2. Suitable time of budding/ grafting in guava

Segregation and recombination of genetic characters during sexual reproduction results in variation of characters. The technology has the positive effects on the fruit quality, shape, size and yield of propagated plants. Likewise, clonal propagation through cuttings, propagation by adopting budding or grafting techniques is another desirable option. Comparative success of different asexual propagation techniques i.e., T-budding, T-grafting (side-grafting) and cleft-grafting with interaction of suitable time for commercial propagation of guava true to type plants was investigated. T-grafting showed highest success percentage (54.3%) (Fig-5) and produced utmost increase in shoot length (29.3 cm) (Fig-6) and leaves per plant (23.0) (Fig-8) when carried out during October. Least success (10%) was recorded for cleft-grafting when carried out in October. Scion stock grafted by this technique during this month took longest duration to sprout (49.5 days) (Fig-7) and produced minimum increase in shoot length (11.4 cm) and also leaves per plant (10.8). Thus, guava plants may also be propagated by T-grafting during October for better success and proceeding growth of plants.

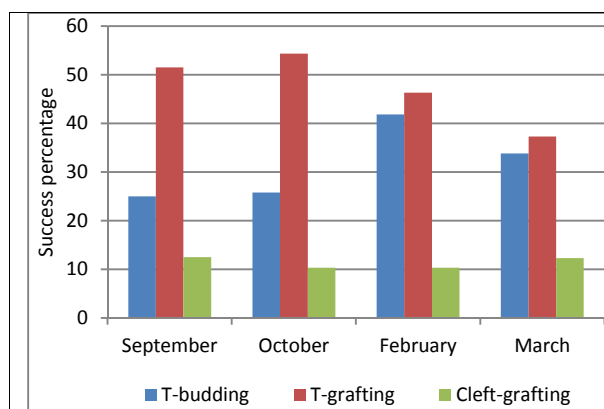


Fig-5: Effect of asexual propagation technique on success percentage of guava

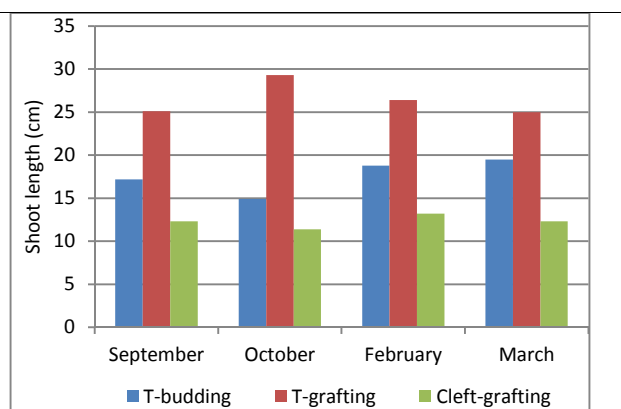


Fig-6: Effect of asexual propagation technique on shoot length of guava

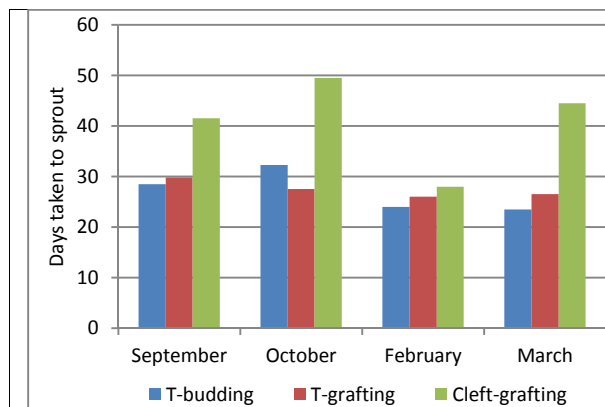


Fig-7: Effect of asexual propagation technique on sprouting duration of guava

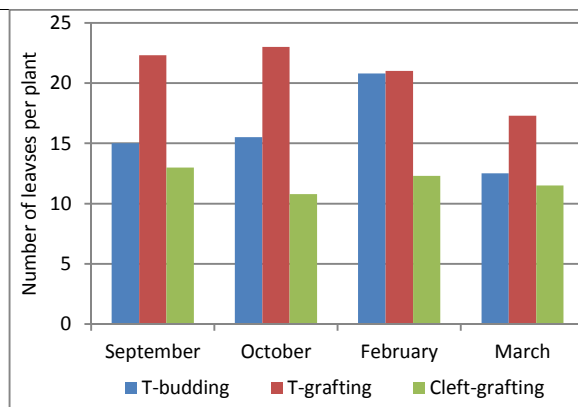


Fig-8: Effect of asexual propagation technique on number of leaves per plant of guava



Root stock



Grafting under shady area



Grafted plant



Plantation in the field

### 3. Rejuvenation of senile guava orchard through canopy management

Senile guava orchards (unproductive/ dried) become burden to guava growers and their rejuvenation is a potential area of applied research. Heading back of such plants was carried out with removal of canopy/ main trunk maintaining different heights from ground i.e., 1.0, 1.5 and 2.0 meter to improve nutrient assimilation and distribution for revamping growth of plants.

Plants headed back at 2.0 meter height took least time (10.0 days) for sprouting and produced highest number of shoots per plant (121.8); however, these plants produced minimum main shoot length (71.3) (*Fig-9*). Longest duration for sprouting was taken by plants headed back at 1.5 meters height (14.1 days), whereas, guava plants headed back at 1.0 meter height produced least number of shoots per plant (81.3). Plants headed back at 1.5 meters produced longest shoot (78.8). Heading back of senile guava orchards may be carried out to start new growth of plants.

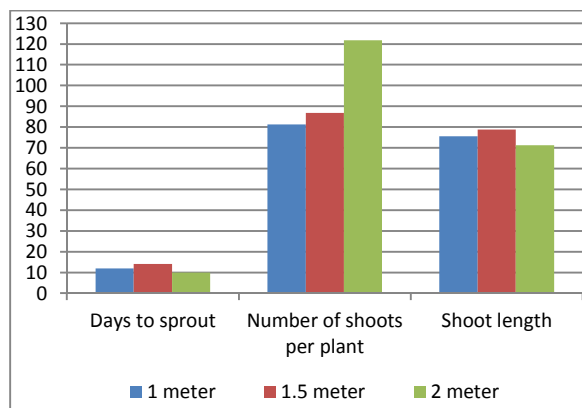


Fig-9: Vegetative growth response of guava to heading back technique



#### 4. Post-harvest losses and increase in price of guava through conventional supply chain in Punjab

Post-harvest losses (PHLs) of fruit are a major problem faced by guava growers for commodity handling and marketing through conventional supply chain. This results in loss of financial returns and also wastage of fruit and unjustified price fluctuations. Study was conducted to measure PHLs of guava fruit and price increase through different layers of marketing system so that the issue may be considered in depth for sustainable strategy

development. Fruits were harvested from orchard in Nankana area and transported to Fruits and Vegetable market, Islamabad. Two categories for harvesting and packing i.e., conventional (blunt tools & belly packing in wooden crate) and improved (sharp harvesting tools & packing according to container capacity in plastic basket/ bins) were compared for quality deterioration of fruits. About 26.8% of fruit is lost (qualitative & quantitative) from farm to retail level when harvested and packed by conventional way; however when same operations are improved, losses are reduced to 17.2% (Fig-10). Guava growers get better sale price of fruit (Rs. 35 per kg) for fruit with improved packing than fruit packed in sub-standard way (Rs. 25 per kg). Similarly fruit quality is preserved for improved packing than conventional way (Fig-11). Increase of price from farm level to retail level is 114-200% depending upon quality with varied share of different layers of intermediaries.

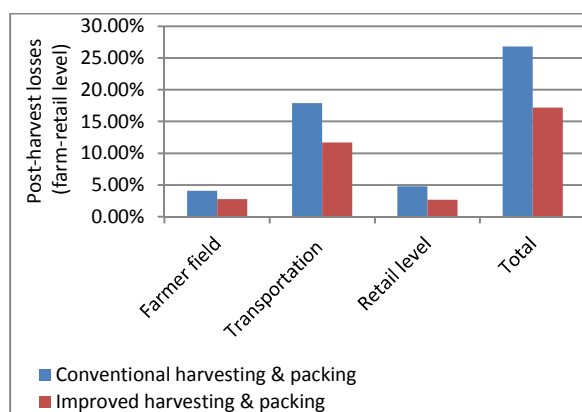


Fig-10: Post-harvest losses of guava through conventional supply chain (farm-retail)

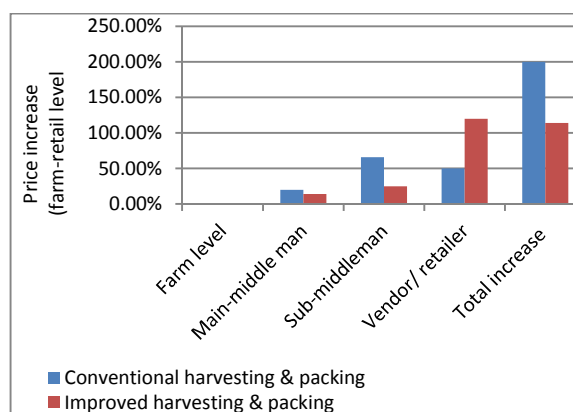


Fig-11: Price increase mechanism of guava through conventional supply chain ((farm-retail))

## b) Pomegranate

### 5. Application of growth regulators for control of fruit cracking of pomegranate

Pomegranate (*Punica granatum* L.) is gaining importance among fruit growers and consumers due to better economic returns, nutritional, medicinal and pharmaceutical value. One of the major problems faced by growers is cracking of pomegranate fruit during development, due to differential growth rate between skin and flesh of fruit; that ultimately deteriorates fruit quality and causes economic loss to farmers. Different chemicals (growth regulators & mineral salt) i.e.,  $\text{KNO}_3$  (Potassium nitrate), NAA (Naphthalene acetic acid), Boric acid and Zinc sulphate were sprayed at early stage of fruit growth, which showed positive impact for decreasing fruit cracking (Fig-13) and improving fruit quality characteristics. Spray with mixture of  $\text{KNO}_3$  (1%)



and Boric acid (0.3%) during 1<sup>st</sup> week of June and July was found best for controlling cracking of pomegranate fruit and improving fruit quality (Fig-14 & 15).

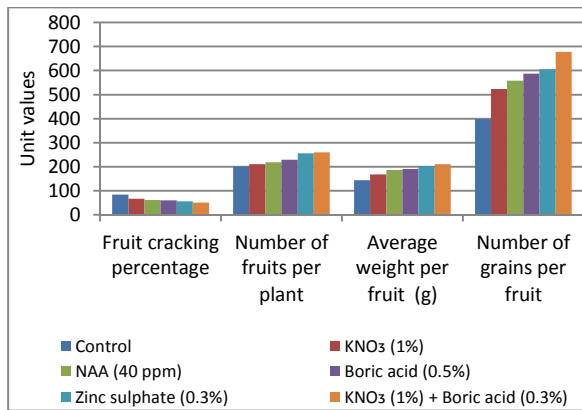


Fig-13: Response of reproductive traits & cracking of pomegranates to growth regulator application

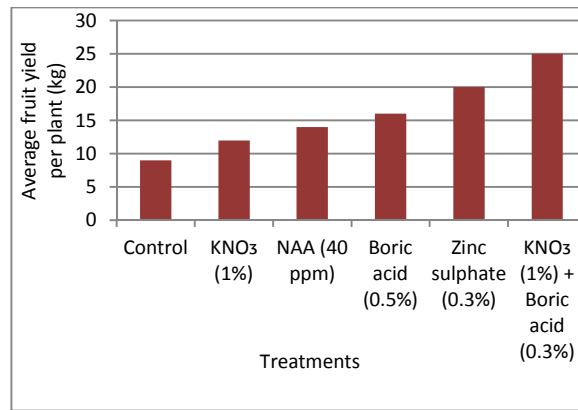


Fig-14: Effect of growth regulator on average fruit yield per plant of pomegranate

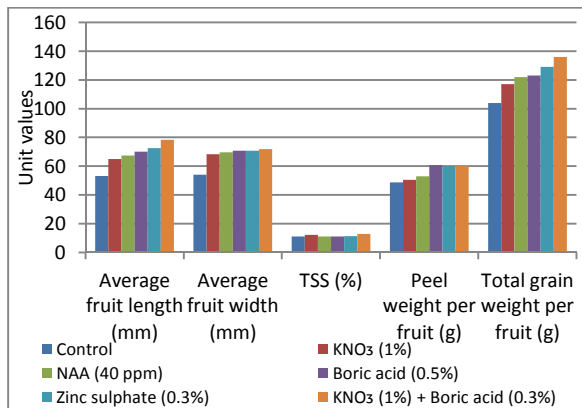


Fig-15: Effect of growth regulator on pomegranate fruit quality



## 6. Suitable asexual propagation technique for jamun

Jamun was propagated in March through different asexual techniques i.e., T-grafting, cleft-grafting and T-budding for production of nursery plants true to type in parental characteristics. Maximum success (20.5%) was recorded for T-grafting, while minimum (10.5%) was observed for cleft-grafting (*Fig-19*). Plants propagated by T-grafting took least time (25 days) for sprouting, produced utmost shoot length i.e., 26.3 cm (recorded after 6 months of propagation), number of leaves (9) and leaf size (62.9 cm<sup>2</sup>). While, plants propagated by cleft-grafting took longest time for sprouting (38 days) and produced least leaf area (32.3 cm<sup>2</sup>). Results of T-budding for shoot length (9.7 cm) and number of leaves per plant (4) were also inferior to T-grafting.

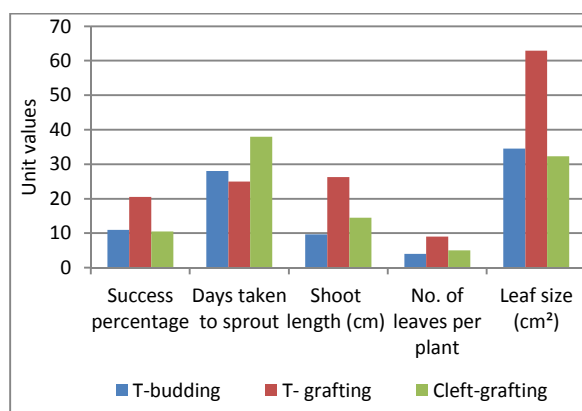


Fig-19: Response of jamun to different asexual propagation techniques



### c) Date Palm

## 7. Suitable temperature for processing/ dehydration of Dates

Date palm (*Phoenix dactylifera* L.) is another important fruit crop of the country and holds a very significant position regarding financial returns from unit area. Pakistan is the 5<sup>th</sup> largest dates producing country in the world. Monsoon rains are the biggest cause of pre-harvest fruit loss of date palm. This loss can be minimized by harvesting of dates before onset of Monsoon rains followed by mechanical dehydration/ processing (hot air oven drying) rather than traditional processing i.e., sun drying in open fields. Different commercial date varieties (Dhakki, Baree, Khudrawi) were dried in hot air oven drier at different temperature (52°C, 55°C, 60°C) and fruit quality was compared to dates dried by conventional way (sun drying). Suitable temperature for dehydration/ drying of dates in hot air dryer was found to be 52 ± 2°C with maintenance of better morphological and physiochemical characters of fruit (Fig-24).

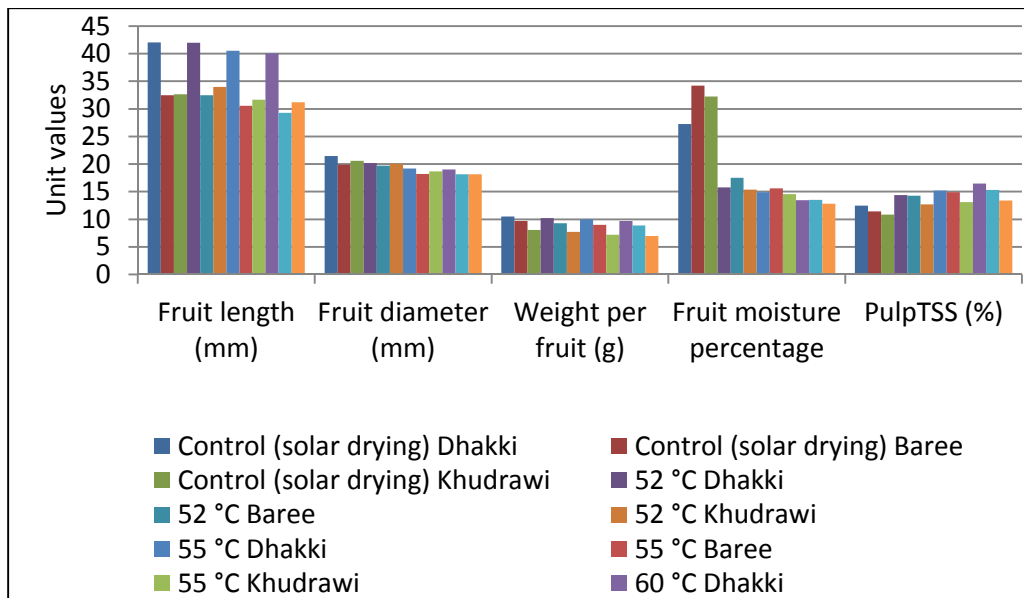


Fig-24: Effect of different drying conditions on fruit quality of potential date palm varieties





#### d) Olive

#### 8. Introduction of olive cultivars under prevailing conditions of Faisalabad

Efforts for transforming Pothowar arid region into olive valley has gained momentum. Keeping in consideration the importance of olive cultivation for self sufficiency in olive oil and its products, different varieties i.e., arbequina, coronikie and gamblic were sown to evaluate their adaptability performance under climatic conditions of Faisalabad. Arbequina attained maximum plant height (69.0 cm), while minimum plant height was observed of gamblic (57.4 cm) (Fig-27). Stem diameter was maximum (10.7 mm) of corankie, whereas, arbequina had minimum stem diameter (12.4 mm). Number of leaves per shoot was also maximum in arbequina (31.2); however, plants of coronikie and gamblic produced 26.6 and 26.8 number of leaves per shoot respectively.

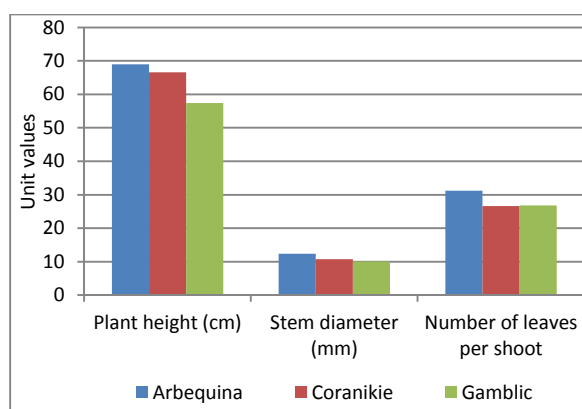


Fig-27: Vegetative growth of different olive varieties under Faisalabad conditions



### DATE PALM RESEARCH SUB-STATION, JHANG

#### **9. Response of Date Palm (cv. Makran) to different nutrition under central Punjab conditions**

Different combinations of nitrogen (N), phosphorus (P) and potassium (K) (To = control, T1 = 1 Kg N, T2 = 1.5 Kg N, T3 = 1 Kg N+1 Kg P, T4= 1.5 Kg N+ 1.5 Kg P, T5= 1 Kg N+1 Kg P+ 1Kg K) were applied to investigate the response regarding yield and quality of Dates Date Palm (cv. Makran). Maximum number of spaths per plant (15) and weight per fruit (115 g) were observed in response to application of NPK combination of 1 kg + 1 kg + 1 kg respectively. While, maximum yield (124.6 kg per plant) was recorded as the result of application of combination of 1.5 kg N + 1.5 kg P.



## 10. Performance of different Date Palm cultivars under central Punjab conditions

135 plants of nine exotic date palm varieties (Ajwa, Anbarah, Khudri, NabutSaif, Sagai, Khalas, Barhee, Shishi, Sultana) have been imported during 2015-16 and planted at Jhang and Bahawalpur for acclimatization study. 177 plants of 9 varieties (Medjool, Lulu, Nemeishi, Raziz, Zamli, Ajwa, Khalas Barhee, Shishi) have been imported during 2016-17. These varieties were planted in research area of the station to evaluate their adaptability and growth characteristics. Maximum height (120.8 cm) was observed of Khudri. While, maximum number of fronds (17.57) and frond length (106.32 cm) were recorded of Shishi and Bahree cultivars respectively.



### HORTICULTURAL RESEARCH STATION, BAHAWALPUR

## 11. Impact of climate regimes on production and quality of local germplasm of Date Palm

Climate of southern Punjab is suited to dates production, yet changing climate is the major hindrance in the best quality production. Therefore, impact of different climate regimes i.e., monsoon rains and high temperature on the production and quality of local germplasm of Date Palm was evaluated. Now, June is receiving more precipitation than that of the past, which may be injurious to early Date varieties i.e., Gajjarwali, Shakri, Halawi and Makran. Economically, Halawi is the best variety at Dhoka stage in south Punjab region followed by Dhaidi, Gajjarwali, Aseel and Zahidi. However; Aseel, and Dhakki are best for making of “chhohara”.

## 12. Characterization and documentation of Date Palm, Ber and Pomegranate germplasm

Registration of varietal traits of different fruits and approval from Federal Seed Certification & Registration Department, Islamabad is prerequisite for varietal approval. Therefore, characterization and documentation of different traits of nine strains of Date Palm (Khurma, Shakri, Shamran, Zahidi, Aseel, Kupra, Haleeni, Halawi and Khudrawi), five strains of ber (Pak-white, Umran, Anokhi, Sufan & SL-Ber) and two strains of pomegranate (Pearl & Golden) was completed. Halawi has the highest yield at Dhoka stage (140-160 kg per plant) followed by Aseel (80-120 kg per plant) and Zahidi (80-100 kg per plant). In case of ber, highest yield was calculated for Pak-white (150-200 Kg per plant), followed by Umran (140-180 Kg per plant) and Anokhi (150-170 kg per plant). TSS was highest for Anokhi (16-20%), while it was lowest for SL-Ber (11-13%).



**13. RESEARCH TEAM****Horticultural Research Institute, Faisalabad*****Mohsin Abbas***

(Horticulturist)

0321-6637055

malikmohsin144@gmail.com

***Muhammad Maaz Aziz***

(Assistant Horticulturist)

0300-4090713

maazaziz\_aari@yahoo.com

***Ghulam Mustafa***

(Assistant Horticulturist)

0333-6505441

gmustafaly@gmail.com

**Date Palm Research Sub-Station, Jhang*****Fayyaz Ahmad***

Assistant Horticulturist

0333-6508068

datepalmjg@gmail.com

**Horticultural Research Station, Bahawalpur*****Muhammad Ikhtlaq***

(Horticulturist)

0333-6446033

mikhlaq68@hotmail.com

***Muhammad Azhar Bashir***

Assistant Horticulturist

0313-6312231

azharbwp67@yahoo.com

**Horticultural Research Sub-Station, D.G. Khan****Miss Naheed Akhtar**

Assistant Horticulturist

0333-8429624

[ahresearchpunjab@gmail.com](mailto:ahresearchpunjab@gmail.com)



