

ANNUAL ABRIDGE REPORT
FOR THE YEAR
2018-19

DIRECTORATE OF HORTIULTURE
AYUB AGRICULTURAL RESEARCH INSTITUTE,
FAISALABAD

			
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OVERVIEW

Agriculture is the back bone of Pakistan's economy as about seventy percent of our population is directly or indirectly involved in this field and fruit production is an important segment of this sector. Generally, horticultural crops fetch 10 times more gross income in comparison to other field crops. The climatic diversity of Pakistan is such that it allows cultivation of nearly all types of fruits; temperate, tropical and sub- tropical. Important fruits grown in Pakistan includes: Citrus, Mango, Guava, Dates, Pomegranate, Litchi, Strawberry Papaya, Olive, Apple, Apricot, Banana, Cherry, Peach, Plums, Pear and a number of dry fruits including Almonds, Pistachios and Walnuts. In the year of 2015-16, total fruit production of the country counts 6567286 tonnes harvested from 804503 hectares area (FV&C, 2015-16). The leading province Punjab contributes 47% in case of cultivated area, whereas, it reaches 67% when comes to fruits production of Pakistan. Citrus, mango and guava are major fruit crops of the province. Among minor fruit crops i.e., Jamun, Phalsa and Ber, respective share of the Punjab province in national production of these fruits is 90%, 57% and 35%. Directorate of Horticulture under the umbrella of Ayub Agricultural Research Institute has been strived for strengthening dedicated research activities for fruit crops to improve sustainable fruit production. Major focus of the Institute is on advance technology standardization and dissemination for quality fruit production of Guava, Pomegranate, Jamun and grapes etc.

RESULTS OF EXPERIMENTS

HORTICULTURAL RESEARCH

INSTITUTE, FAISALABAD

A. Guava

1. Suitable time for rooting of Guava (*Psidium guajava*) soft wood cuttings immersed with Indole butyric acid (IBA)

Conventionally, seed sowing was the only propagation mean commercially used for guava crop that leads to variation in valuable genetic characteristics. However, due to hard seeds, guava propagation through seeds remained a tough job. Vegetative propagation (through cutting) is highly desirable but there are many factors responsible for its success percentage. The key factors include cutting type, time of propagation and growing media used for nursery establishment. Current investigation was carried out to find the best planting time (February, March, August, September) for root induction and survival of IBA treated (0.2%, 0.4%, 0.6%) guava softwood cuttings (GSWCs). Cuttings (15 cm long) having 4-5 buds of young leaves were taken from current season growth of five years old guava plant (var. *Gola*). Treatment of cuttings with 0.4% IBA, plantation during September showed highest survival percentage (66.3%) (Fig.1), increase in branch length (12.8 cm) (Fig. 2) and number of leaves per plant (25.8) recorded after 60 days (Fig. 3). While, maximum number of roots per plant (27.7) recorded at transplantation stage (90 days from planting) were also observed in this treatment and propagation time (Fig.4). Cuttings of control treatment planted in March exhibited minimum success percentage (8.8%), increase in branch length (3.1 cm), number of leaves (12.5) and number of roots per plant (12.4) (Fig.1,2,3,4). The results of current investigation suggest that treatment of guava softwood cuttings with 0.4% IBA (4000 mg per liter of water) may be used for commercial guava propagation. Additionally, according to our local weather conditions, the month of September was found best planting for guava vegetative propagation.

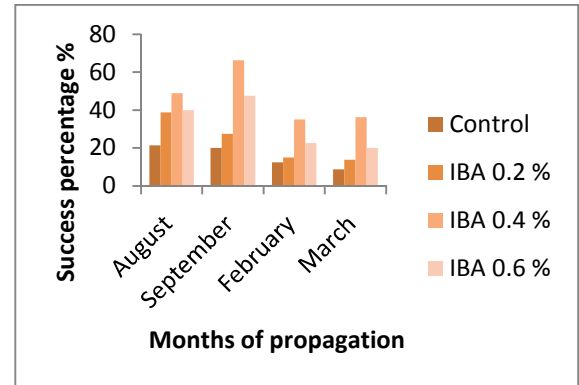


Fig. 1: Effect of IBA on success percentage of GSWCs

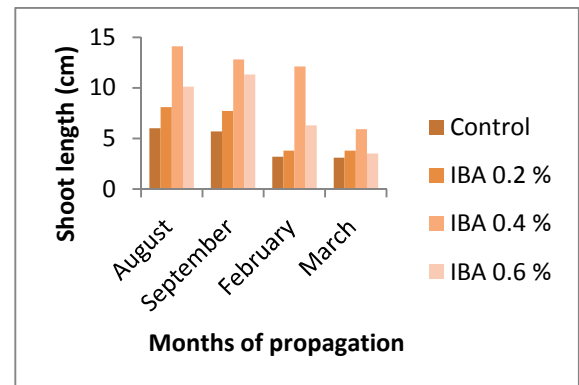


Fig. 2: Effect of IBA on branch length (cm) of GSWCs (60 days of plantation)

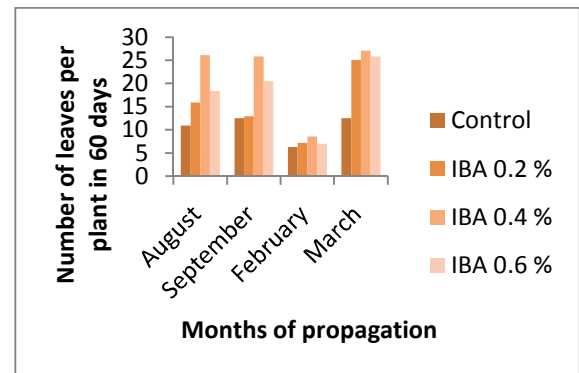


Fig. 3: Effect of IBA on number of leaves per plant of GSWCs (60 days of plantation)

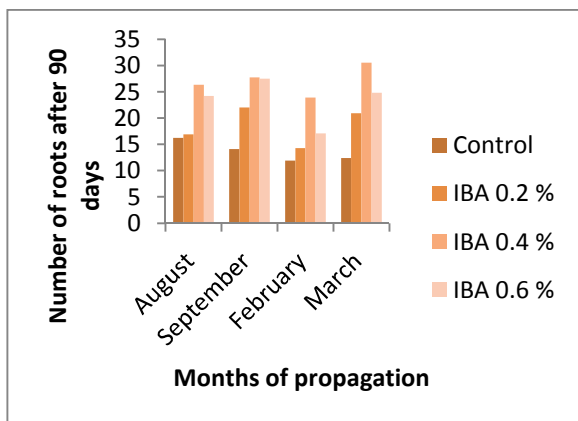


Fig. 4: Effect of IBA on number of roots per plant of GSWCs (90 days of plantation)



Fig. 5: Prepared Guava soft wood cuttings for production of true to type nursery plants



Fig. 6: Successful root development in Guava cuttings immersed in 0.4% IBA after 90 days of plantation



Fig. 7: Full grown guava nursery plants developed from softwood cuttings in polythene bags



Fig. 8: Planted cuttings depicting successful sprouting in raised beds under tunnel

2. Suitable time of budding/ grafting in Guava (*Psidium guajava*)

Guava (*Psidium guajava* L.) is considered to be one of the best, nutritionally valuable fruit crop. Besides its high nutritional value, it is prolific bearer that bears heavy crop regularly and farmers get good remuneration from it. Therefore, a number of farmers in Punjab have taken up guava orcharding on a commercial scale. Conventional method of propagation cannot fully meet the increasing demand of planting stock because low success rate and resultantly genetic variations. Therefore, it was direly needed to develop protocols, which can provide uniform, high quality genetically predictable stocks. Hence, a brief study was carried out to compare success of different vegetative propagation means i.e., T-budding, T-grafting and cleft-grafting with respect

to suitable time for commercial propagation of guava true to type plants. The recorded data showed that T-grafting gave highest success percentage (53.8%) (Fig.9) and produced maximum increase in shoot length (29.2cm) (Fig.10) and leaves per plant (27.4) (Fig.12) when grafting carried out during October. Lowest mean values (13.4%) were noted in case of cleft-grafting when carried out in the month of February (Fig.9). Maximum days were taken to sprout by the stocks grafted in October month (42.3 days) (Fig.11). However, minimum leaf number (12.8) was recorded in plants propagated through cleft grafting in the month of March (Fig.12). Hence based on the current investigations, it can be deduced that guava plants may also be propagated by T-grafting during October month for maximum success and plant survival as well as proper growth and development of sprouted plants.

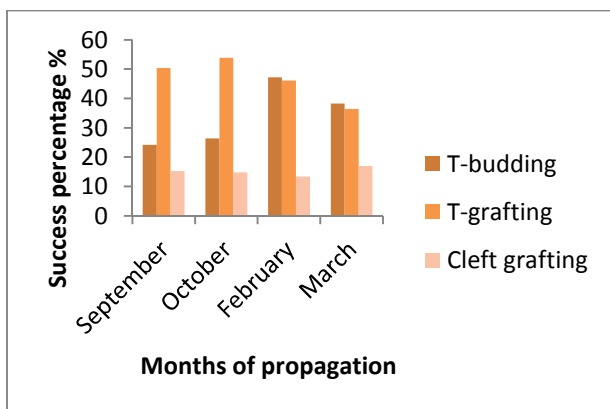


Fig.9: Effect of asexual propagation technique on success percentage of guava

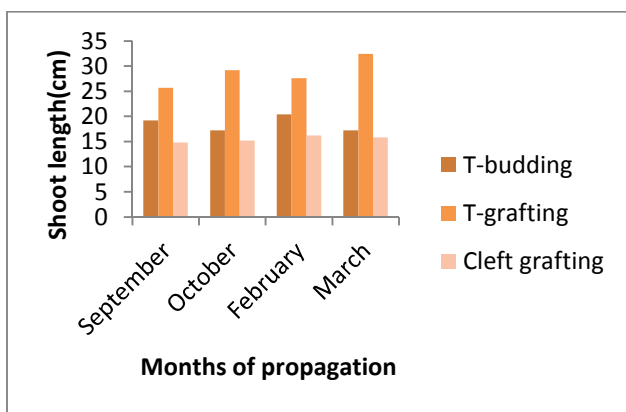


Fig.10: Effect of asexual propagation technique on shoot length (cm) of guava

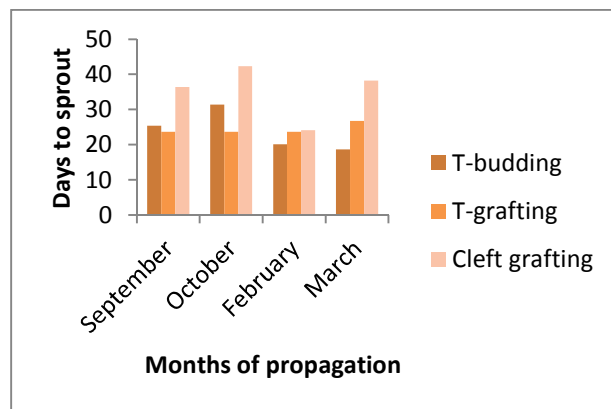


Fig.11: Effect of asexual propagation technique on sprouting (days) duration of guava

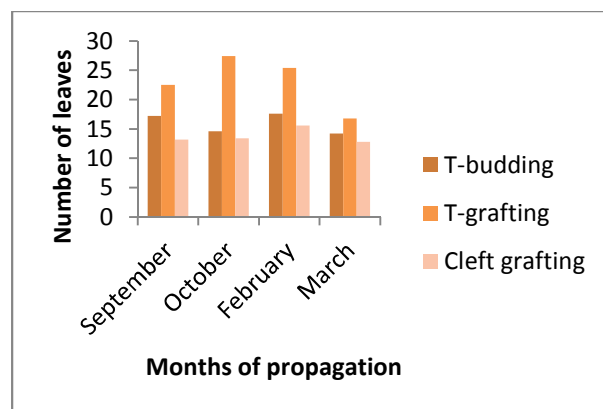


Fig.12: Effect of asexual propagation technique on number of leaves per plant of guava



Fig.13: T-grafting performed on pot grown Guava plant

B. Citrus

3. Evaluation of different strains of Seedless Kinnow (*Citrus reticulata balanco*) under Faisalabad climatic conditions

Citrus stands among the most important fruits in the world as well as in Pakistan. However, a large number of seeds present in the fruit are totally undesirable for consumer as well as export point of view. Seedlessness has always been a striking idea for the pomologists. Selection is an easy and reliable tool for fruit breeding to achieve seedlessness. Given below are results of a research study in which different selections were made of low seeded or seedless citrus plants. Results of previous year revealed that maximum plant height (8.22ft) and plant canopy (62.2ft²) were possessed by the plants of T2 (Selection from Shujat Warriach) (Table.1). No seeds were present in fruits of T-1, 2, 3, 4 & 5 (All selections from Shujat Warriach) (Table.1). Fruit weight was maximum (154.2 g) in T-3 (Selection from Sujah Warriach) and fruit size was maximum (50.2 cm²) in plants of T-6 (Selection from Asad Tiwana) (Table.2). While considering biochemical characteristics, TSS (Total soluble solids) remained maximum (11.60) in treatment T4 &9 (Selection from Sujat Warriach and selection from Sultan Farm) (Table.2). The current year data is being recorded and will be provided on harvesting of fruit. Currently the data regarding vegetative parameters has been recorded and given below in Table 3. The data regarding reproductive characteristics will be provided after fruit harvesting.

Table.1: Vegetative and reproductive attributes of seedless Kinnow strains (*Citrus reticulata* Blanco (2018))

Strains/ selection	Plant height (ft)	Plant Canopy (ft ²)	Stem girth (Inch)	No. of fruits/plant	Number of seeds
R9P2 (Shujat Warriach)	7.2	50.4	11.8	4.0	0.0
R3P5 (Shujat Warriach)	8.2	62.2	14.2	6.0	0.0
R1P3 (Shujat Warriach)	6.2	55.7	12.8	10.0	0.0
R1P4 (Shujat Warriach)	6.5	28.1	11.7	8.00	0.0
R4P3 (Shujat Warriach)	6.4	50.4	14.3	9.0	0.0

AT (Asad Tiwana)	6.7	33.6	11.7	12.0	2- 4
AT (Asad Tiwana)	7.2	51.1	14.2	13.0	2- 3
AT (Asad Tiwana)	6.5	54.2	15.3	9.0	0- 2
L1P1 (Sultan farm Vehari)	6.2	57.9	14.2	8.0	2- 4
L3P2 (Sultan farm Vehari)	6.3	45.8	17.7	10.0	0- 1
L4B4 (Sundar farm)	6.4	39.3	14.2	13.0	0- 2

Table.2: Quality attributes of Seedless Kinnow strains (*Citrus reticulata* Blanco (2018))

Strains/ selection	Fruit size (cm ²)	Fruit weight (g)	TSS %age	Titration acidity	TSS/ TA ratio
R9P2 (Shujat Warriach)	37.0	129.5	11.0	0.9	12.3
R3P5 (Shujat Warriach)	38.6	123.5	11.2	0.8	12.5
R1P3 (Shujat Warriach)	31.6	154.2	11.5	0.6	17.9
R1P4 (Shujat Warriach)	34.5	149.6	11.6	0.8	13.0
R4P3 (Shujat Warriach)	42.3	145.2	10.8	0.7	14.2
AT (Asad Tiwana)	50.2	149.1	11.0	1.2	8.5
AT (Asad Tiwana)	39.4	153.5	11.5	1.1	10.4
AT (Asad Tiwana)	45.7	147.2	12.0	1.2	9.3
L1P1 (Sultan farm Vehari)	45.0	137.5	11.6	0.8	13.0
L3P2 (Sultan farm Vehari)	47.6	145.7	10.8	0.7	15.4
L4B4 (Sundar farm)	48.5	138.6	11.0	0.7	15.7

Table 3: Vegetative attributes of Seedless Kinnow (*Citrus reticulata* Blanco(2019))

Strains/ Selection	Treatments	Plant height (ft)	Plant Canopy (ft ²)	Stem girth (Inches)	Leaf Area (cm ²)	No. of fruits/ plant
R9P2 (Shujat Warriach)	T1	7.5	53.96	12.0	32.05	12.58
R3P5 (Shujat Warriach)	T2	8.5	66.40	14.4	34.48	13.00
R1P3 (Shujat Warriach)	T3	6.5	59.28	13.2	24.97	14.33
R1P4 (Shujat Warriach)	T4	6.5	31.68	12.0	26.56	16.67
R4P3 (Shujat Warriach)	T5	6.7	54.00	14.4	39.17	16.83
AT (Asad Tiwana)	T6	7	37.20	12.0	41.98	6.75
AT (Asad Tiwana)	T7	7.5	54.67	14.4	35.09	5.08
AT (Asad Tiwana)	T8	6.85	57.76	15.6	33	7.00
L1P1 (Sultan farm Vehari)	T9	6.5	61.50	14.4	42.89	15.57
L3P2 (Sultan farm Vehari)	T10	6.5	49.40	18.0	26.96	15.00
L4B4 (Sundar farm)	T11	6.75	42.90	14.4	52.58	15.71

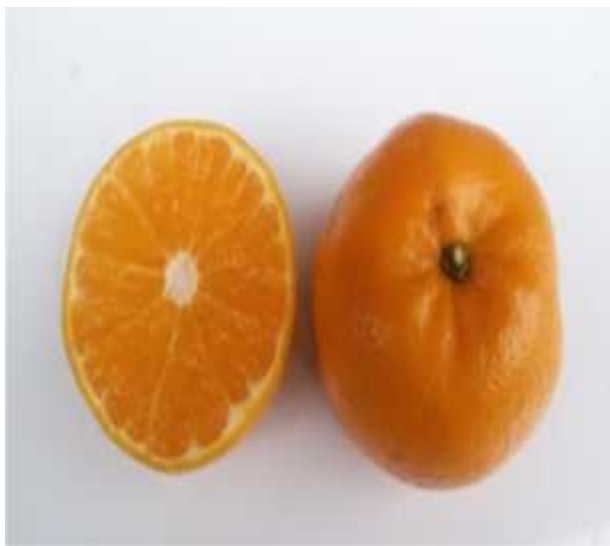


Fig.14: Fully ripened seedless kinnow strain selected from Shujat Waraich Farm



Fig.15: Current year fruit development stage of seedless Kinnow (selection of Shujat Waraich)

C. Pomegranate

4. Application of chemicals for control of fruit cracking in Pomegranate (*Punica granatum* L.)

Area under pomegranate cultivation in our country is increasing due to its versatile adaptability, hardy nature, high yield, better keeping quality, therapeutic values. Fruit cracking is an important physiological disorder in pomegranate, causing about 20-40 % yield losses. It is essential to understand causes of fruit cracking and their remedial measure to ensure good quality of fruit. There are many factors responsible factors for this type of fruit cracking in pomegranate, however, nutrient deficiency is of prime importance.

In current study, various growth regulators & mineral nutrients i.e., KNO₃ (Potassium nitrate), NAA (Naphthalene acetic acid), Boric acid and Zinc Sulphate were sprayed in different concentrations at early stage of fruit growth and development, which positively influenced fruit cracking (Fig.16) and improved fruit quality characteristics. Combined effect of KNO₃(1%) and Boric acid (0.3%) when sprayed on 1st week of June and July was found best for management of fruit cracking of pomegranate and in improving fruit quality (Fig.17 & 18). It may be concluded that regular spray of micronutrients along with good orchard management practices can lead to less cracked fruits.

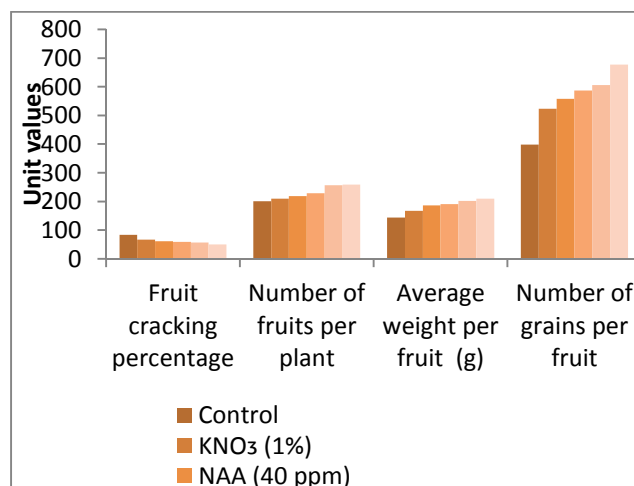


Fig.16: Response of reproductive traits & cracking of pomegranates to growth regulator application

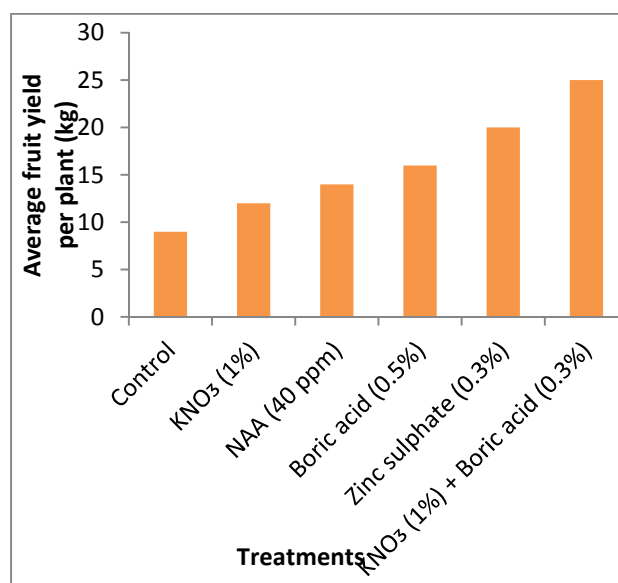


Fig.17: Effect of growth regulator on average fruit

yield in pomegranate

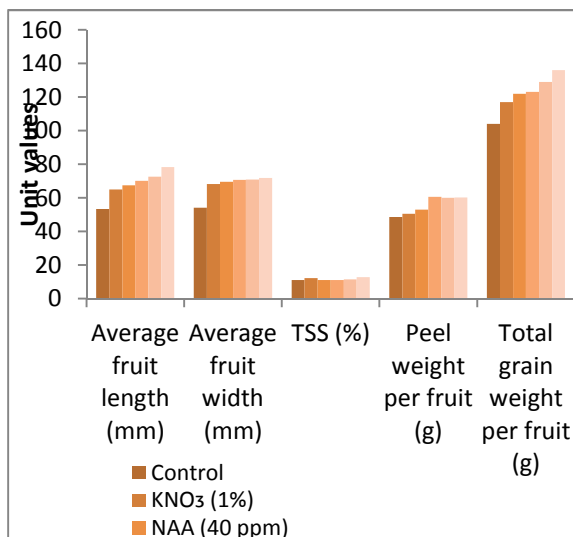


Fig.18: Effect of growth regulator on pomegranate fruit quality



Fig.19: Cracking physiological disorder in Pomegranate (control)

D. Jamun

5. Response of Jamun (*Syzygium cumini*) to different asexual propagation techniques and propagation time

Jamun (*Syzygium cumini*) is considered as an important minor crop in Pakistan. An appropriate propagation technique is direly

needed for its multiplication. Due to its medicinal and nutritive value, demand is increasing day by day that will require selected plants of superior quality with desired potential. The research work on vegetative propagation of this crop is rather scanty at present. Therefore, the present research was performed to assess the effect of different grafting dates and grafting method on the success and relative growth of Jamun.

The obtained results revealed that T-grafting when performed in the month of October gave maximum success rate (55.25%). However, it was recorded minimum (7.5%) when cleft grafting method was used in the month of February (Fig. 20). Maximum days (45.5) were taken by the scion to sprout in case of cleft grafting in the month of September and these values were recorded minimum in case of T-budding carried out in the month of February (Fig. 21). Maximum leaf number (25) was counted in sprouts of February performed T-grafting and lowest value on this ground was recorded for cleft grafting (5.25) (Fig. 22). Leaf area was noted maximum (141 cm²) in T-grafting in the month of February (Fig.22). Highest value (6.75) for number of shoots was measured in case of T-grafting when carried out in the month of October (Fig.24).The shoots attained maximum (29.37cm) length in 60 days in those plants budded through T-budding in February, while, it was observed minimum (8.57cm) in cleft grafting in March (Fig 26). The stem girth(3.5cm²) was noticed maximum in T-budding performed in October. It may be deduced from gathered results that T-grafting is most appropriate technique for Jamun propagation and best time for its propagation is February.

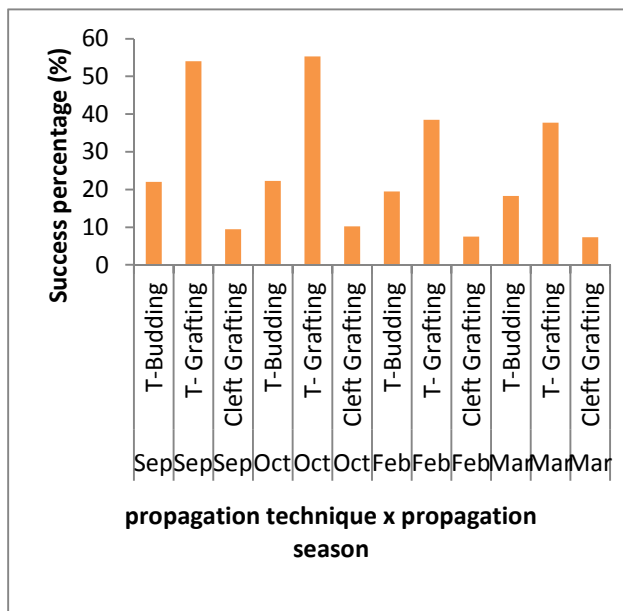


Fig.20: Effect of propagation technique and season on success percentage of Jamun

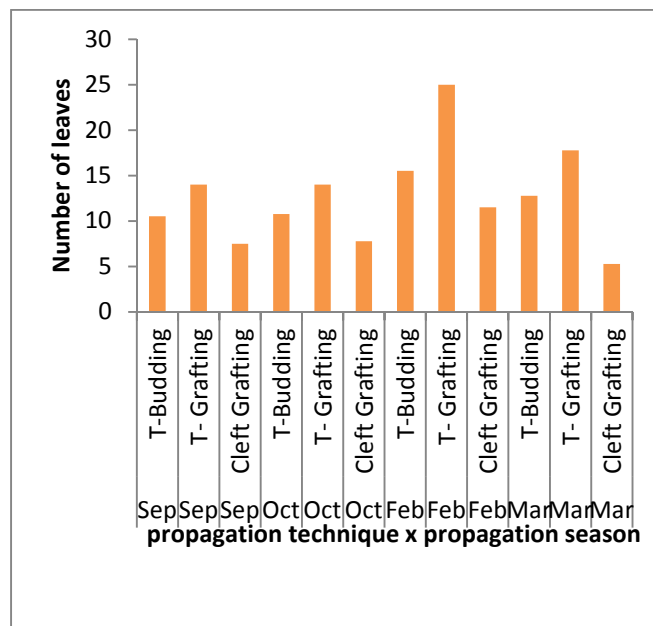


Fig.22: Effect of propagation technique and season on leaf number of Jamun

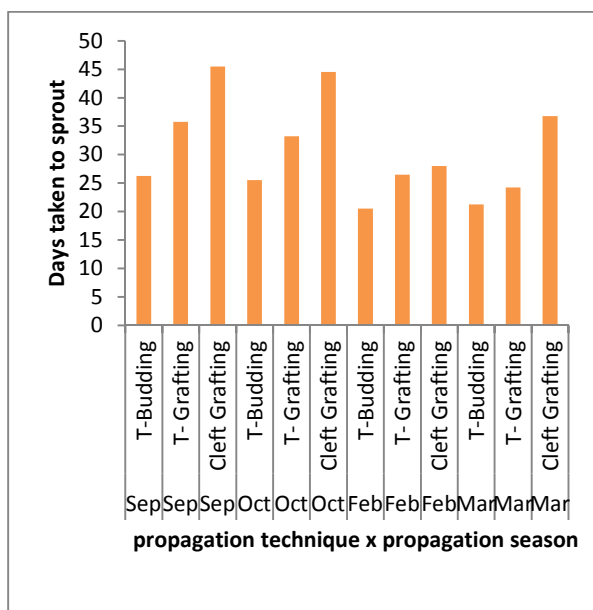


Fig.21: Effect of propagation technique and season on sprouting time of Jamun

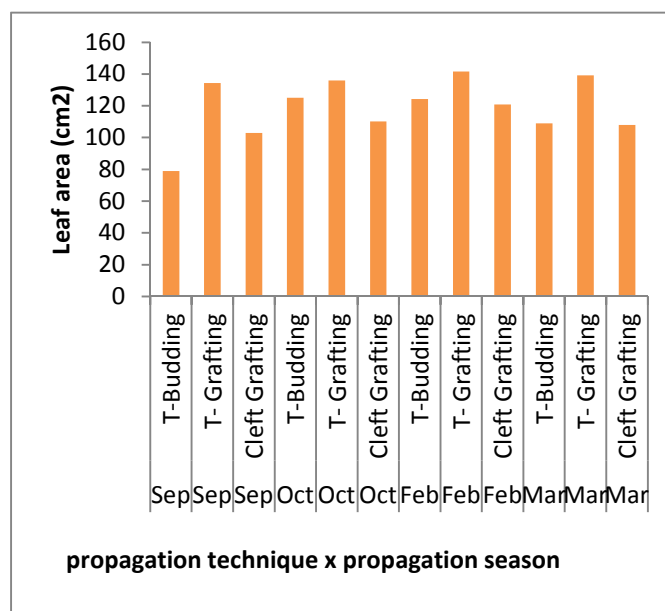


Fig.23: Effect of propagation technique and season on leaf area of Jamun

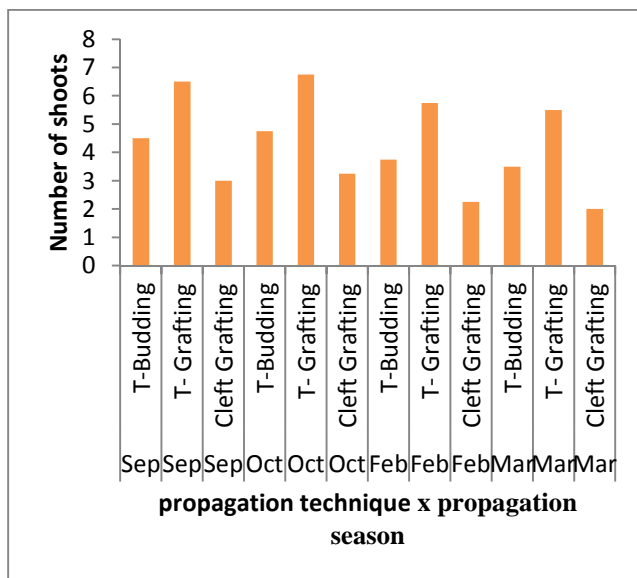


Fig.24: Effect of propagation technique and season on number of shoots of Jamun



Fig 25: Successful graft union and sprouting from T-grafted Jamun rootstock

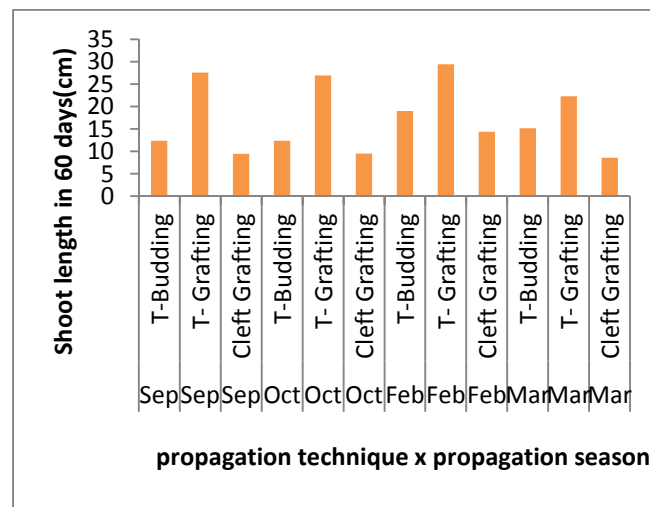


Fig.26. Effect of propagation technique and season on shoot length of Jamun

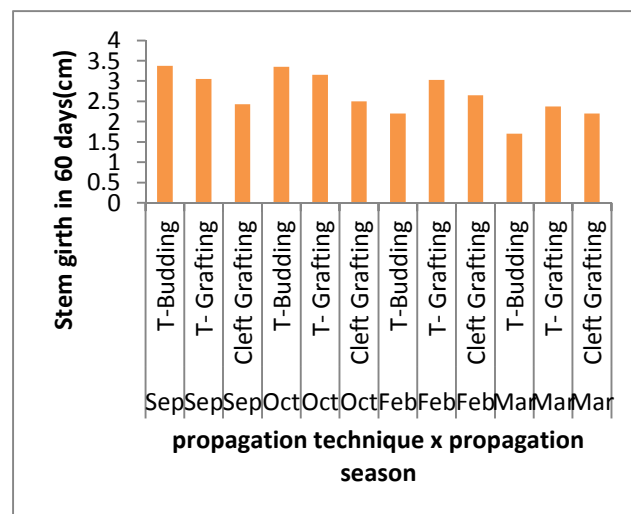


Fig.27. Effect of propagation technique and season on stem girth of Jamun

E. Date Palm

6. Standardization of Suitable temperature for processing/ dehydration of Dates (*Phoenix dactylifera L.*)

Pakistan is the fifth largest producer of dates in the world. Sindh and Baluchistan are main date producing provinces; however, it is being cultivated successfully in Punjab also. In Punjab, Monsoon rains are major constraint for quality fruit production of dates. The major damage caused by rain occurs when either the rain is

early, or the dates are late in ripening. A light shower with prolonged periods of cloudy weather and high relative humidity may cause more damage than heavy rain followed by clear weather and dry winds.

Due to changing patterns of rains in Punjab in response of climate change, the problem can only be addressed by harvesting of dates before onset of Monsoon rains and mechanical dehydration/processing (hot air oven drying) rather than traditional processing i.e., sun drying in open fields. In current research study, a number of commercial date varieties (Dhakki, Barhee, Khudrawi) were dried in hot air oven drier at different temperature levels (52°C, 55°C, 60°C) and fruit quality was compared to dates dried by conventional method (sun drying). Optimum 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.28). Based on the data obtained, mechanical date drying under controlled environmental conditions is recommended over the common sun drying method.

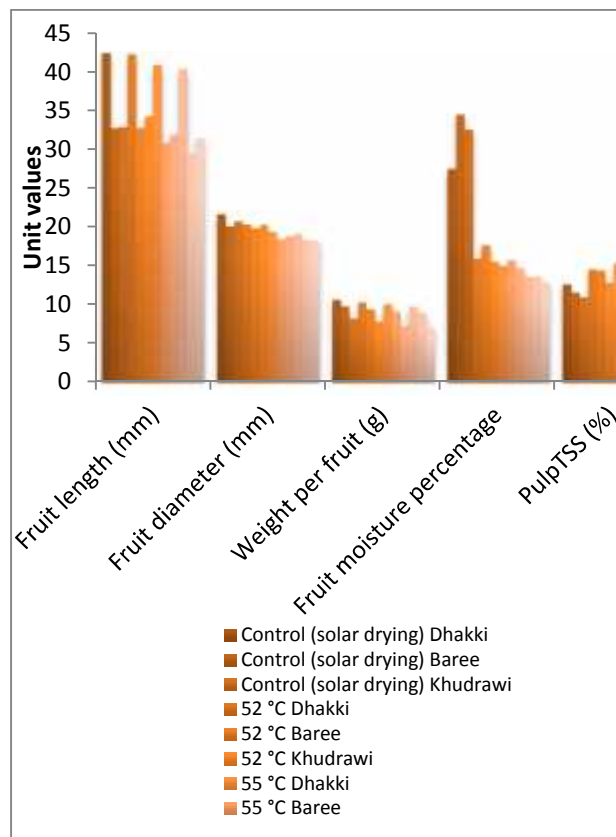


Fig.28: Effect of different drying conditions on fruit quality of potential date palm varieties



Fig.29: Electricity driven Hot Air Dryer used for dates processing



Fig.30: Comparison of controlled conditions date drying vs conventional sun drying



Fig 31: Ripening stages of fresh dates in making of processed dates

7. Performance of exotic date palm cultivars under climatic conditions of Faisalabad:

The Ajwa date variety has great spiritual and medicinal importance. The Ajwa is most popular and expensive date which is believed to be only grown to bearing stage at the city of Madinah. So, to evaluate its performance in Pakistan in comparison to some other date cultivars, a research study has been designed in which Ajwa, Amber and Khalas cultivars of date palm were planted at experimental site of Horticultural Research Institute.

The data regarding vegetative attributes of date palm varieties revealed that Amber variety attained maximum plant height (50.40 inches) and Ajwa remained less in this attribute with 48.30 inches. Maximum stem girth (40.80 inches) was recorded in date palm cultivar Khalas and minimum (28.8 inches) in date cultivar Ajwa. Khalas variety showed maximum number of fruits (40.75), whereas, minimum fruits (15.50) were observed in cultivar Ajwa variety (Table.4).

Table.4 Growth attributes of exotic date palm cultivars

Variety Name	Plant height (inches)	Stem girth (Inches)	No. of Fronds	Length of Fronds	No. of leaflets	No. of suckers	No. of spathes	No. of fruits/ plant
Ajwa	48.3	28.8	14.5	78.6	7.25	1.25	1.25	15.5
Khalas	49.8	40.8	16.2	87.9	83.5	8.25	2.00	40.7
Amber	50.4	38.4	21.7	89.1	91.7	2.00	0.25	21.5



Fig. 32: Amber date cultivar on fruit development stage on 30.05.2019, planted at experimental orchard of HRI



Fig. 33: Khalas date cultivar on fruit development stage on 30.05.2019, planted at experimental orchard of HRI



Fig 34. Ajwa date cultivar on fruit development stage on 30.05.2019, planted at experimental orchard of HRI

F. Olive

8. Introduction of Olive (*Olea europaea*) cultivars under climatic conditions of Faisalabad

Interest in olive oil production and consumption has expanded olive cultivation to regions and countries outside the Mediterranean Basin. Climatic conditions of Pothohar region of Pakistanis suitable for its successful cultivation. Keeping in consideration the importance of olive cultivation for self-sufficiency in olive oil and its products, different varieties i.e., Arbequina, Koronikie and Gamlick were also planted to evaluate their performance under climatic conditions of Faisalabad.

The results revealed that Arbequina variety attained maximum plant height (78 cm), followed by Gamlick, while minimum value was recorded in Koronikie (66 cm) for this attribute (Fig.35). However, stem diameter was observed maximum (14.1 mm) in Arbequina variety, whereas, Gamlick was found with minimum stem diameter (11.4 mm). Highest values for number of leaves per 10 cm of shoot were also recorded in Arbequina variety (45.6), Moreover, plants of Koronikie and Gamlick produced 32.6 and 37.7 number of leaves respectively. When it comes to shoot length, Arbequina variety remained best in this attribute possessing (65.2 cm) shoot length. Whilst lowest values (57.1cm) for shoot length were noted in Koronikie variety as depicted in Fig. 35. Maximum shoots (98.6) were exhibited by Arbequina while minimum number of shoots was given by Koronikie variety (84.3) (Fig.35). It may be deduces from the obtained data that Arbequina variety performed best in all studied vegetative growth parameters.

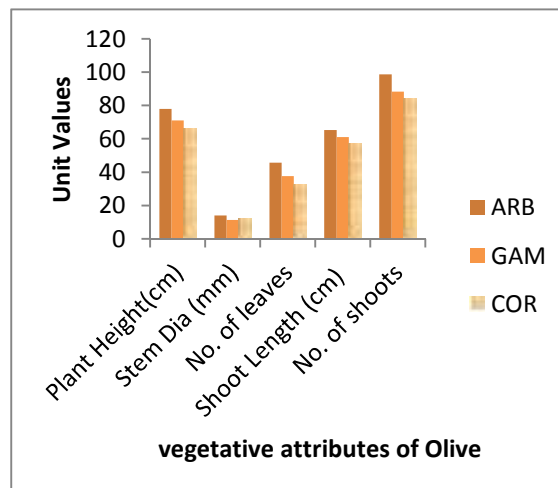


Fig.35: Vegetative stage of different olive varieties under Faisalabad conditions



Fig.36: Three years old Olive plant (Cultivar Arbequina) at vegetative stage



Fig 37: Three years old Olive plant (Cultivar Koranikie) at vegetative stage

DATE PALM RESEARCH SUB-STATION, JHANG

9. Response of Date Palm (cv. Makran) - various nutrition composition under central Punjab conditions

Different combinations of nitrogen (N), phosphorus (P) and potassium (K) (T0= 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 Date yield and quality of 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 1kg +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.



Fig 38: Plants of Makran date variety without fertilizer application (T0 or Control) at DPRSS, Jhang



Fig. 39: Suckers production in plants of Makran date variety received 1000gm Nitrogen at DPRSS, Jhang



Fig. 40: Suckers production in plants of Makran date variety received 1500gm Nitrogen at DPRSS, Jhang

10. Performance of Exotic Date Palm germplasm under central Punjab conditions

Suckers of promising exotic date palm cultivars (Ajwa, Anbarah, Khudri, Nabut Saif, Sagai, Khalas, Barhee, Shishi, Sultana) have been imported during 2015-16 and planted at Jhang for acclimatization study as it is hard to believe that Ajwa date can be grown successfully outside the holy city of Madinah. However, the project was expanded and more varieties were incorporated in acclimatization study (Medjool, Lulu, Nemeishi, Raziz, Zamli, Ajwa, Khalas, Barhee, Shishi) during 2016-17. These varieties were planted in research area of the station to evaluate their adaptability and growth characteristics. Maximum plant height (242 cm) was observed of date

cultivar Ajwa and minimum height (185cm) was attained by the plants of Khudri variety (Table.5). While, maximum number of fronds (39.57) was recorded in date cultivar Barhee. The data regarding frond length revealed that maximum frond length (185 cm) was recorded in date cultivar Amber (Table.5).

Table 5. Vegetative attributes of exotic date palm cultivars

Variety	Plant Height (cm)	No. of fronds	Fronds Length (cm)	No. of Pinnae	No of suckers
Ajwa	242	14.28	173.71	82.8	10.42
Amber	234	16	185.71	70	1.28
Barhee	237	39.57	156.57	42.7	2.14
Khalas	188	12.14	143.57	54.5	4.28
Khudri	185	27.85	82	54	5.57
Nabut ul Saif	190	14.57	89.71	60.4	4.71
Saagi	214	18.28	111.57	70.5	3.42
Shishi	210	16.42	145.14	68	7
Sultana	193	11.14	125.42	64.5	2.14



Fig.11: Bahree exotic date cultivar on fruit development stage on 19.05.2019, planted at experimental orchard of DPRSS, Jhang



Fig.42: Sultana exotic date cultivar on fruit development stage on 19.05.2019, planted at experimental orchard of DPRSS, Jhang



Fig. 43: Ajwa exotic date cultivar on fruit development stage on 19.05.2019, planted at experimental orchard of DPRSS, Jhang



Fig.44: Nabut e Saif exotic date cultivar on fruit development stage on 19.05.2019, planted at experimental orchard of DPRSS, Jhang



Fig.45: Khudri exotic date cultivar on fruit development stage on 19.05.2019, planted at experimental orchard of DPRSS, Jhang



Fig.46: Saagai exotic date cultivar on fruit development stage on 19.05.2019, planted at experimental orchard of DPRSS, Jhang

HORTICULTURAL RESEARCH

STATION, BAHAWALPUR

11. Impact of climate regimes on production and quality of local germplasm of Date Palm (*Phoenix dactylifera*).

Date is important fruit commodity of this country which is generally grown in arid conditions. The southern part of Punjab province is considered best for date production, but fluctuating climatic conditions is the major hindrance in best quality production.

Keeping in view the aforementioned facts, a research study has been designed to evaluate the impact of different climate regimes i.e., monsoon rains and abrupt high temperature on the production and quality of local date germplasm. Currently, the month of June is receiving more precipitation than that of the past, which may be injurious to early maturing date varieties i.e., Gajjarwali, Shakri, Halawi and Makran. The findings of this study revealed that Halawi is the best variety in south Punjab region at Dhoka stage from economic point of view followed by Dhaidi, Gajjarwali, Aseel and Zahidi. However; Aseel and Dhakki are best for making of dry dates (Chohara).

12. Characterization and documentation of Date Palm (*Phoenix dactylifera*), Ber (*Ziziphus mauritiana*) and Pomegranate (*Punica granatum*) germplasm

Selection of approved, high yielding variety is the main thing to consider while a person is heading towards orchard establishment. However, we are lacking in this respect as a number of fruits have no registered varieties. The variety registration of varietal traits of different fruits and approval from 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 and SL-Ber) and two strains of pomegranate (Pearl and Golden) was completed (Fig.44). The results regarding yielding capacity of various strains revealed that Halawi had 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, the maximum recorded yield was found in Pak-white (150-200 Kg per plant), followed by Umran (140-180 Kg per plant) and Anokhi (150-170 kg per plant). Values of total soluble solids were noted maximum in Anokhi (16-20%).



Fig.47: Genetic diversity in various date palm strains characterized for varietal approval

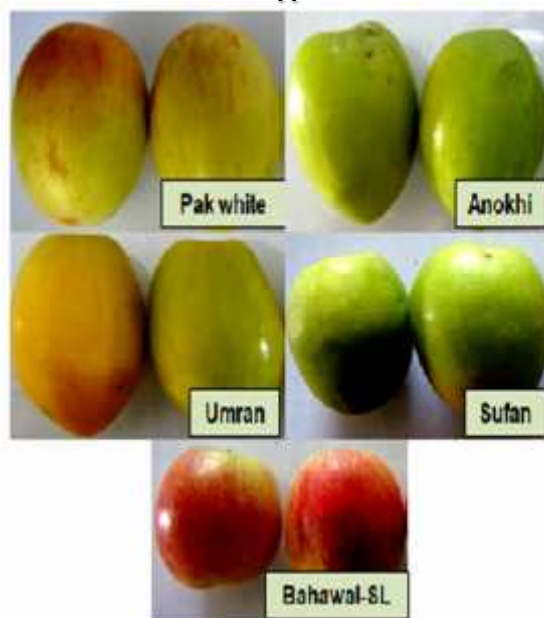


Fig.48: Genetic diversity in different Ber strains characterized for varietal approval

13. Integrated approach to combat physiological disorder of Pomegranate (*Punica granatum L.*) cracking

Pomegranate (*Punica granatum L.*) belongs to the family Punicaceae. It is one of the most delicious as well as nutritious fruit. With understanding of its nutritional, medicinal and pharmaceutical importance as well as developments in production, postharvest techniques and food technology, it has become a popular and economically important fruit crop around the world. Fruit cracking is a physiological disorder of pomegranate, which deteriorates quality of fruit and results in heavy economic losses in southern Punjab.

Horticultural Research Station planned and conducted experiment to find out the best chemical combination to control fruit cracking of Pomegranate. This experiment was conducted at two different sites Horticultural Research Station, Bahawalpur and Horticultural Research Sub-station, Dera Ghazi Khan. It was concluded that foliar spray of various chemicals such as Borax, KNO_3 and $MgSO_4$ during fruit growth had reduced fruit cracking% and improved fruit characteristics. It had been concluded from results of this study that foliar spray of 0.05% Borax + 1% KNO_3 + 1% $MgSO_4$ at monthly interval during May June gave the best result with minimum cracking %age at Horticultural Research Station (7%), Bahawalpur and with at HRSS, D.G. Khan (8%). This treatment also gave maximum fruit weight (155g) and highest yield (60 Kg/plant) in comparison to other experiments.



Fig.49: Appearance of healthy pomegranate fruit VS Cracked fruit

14. Performance evaluation of exotic germplasm of Date palm at Bahawalpur

Fourteen exotic Date palm varieties viz Sultana, Shishi, Sugai, Nabt-ul-Saif, Khudri, Khalas, Barhee, Amber, Ajwa, Medjoul, Lulu, Nemeishi, Raziz and Zamli were planted at Horticultural Research Station Bahawalpur during March, 2016 and Sept-Oct., 2017 (Table.6). These plants are being evaluated for performance evaluation. The results obtained on different parameters are tabulated (Table.7).

Table 6. Total plants of exotic date palm cultivars at Bahawalpur station

Treatment	Variety	Number of plants planted during March, 2016	Number of plants planted during Sept-Oct, 2017	Total No. of Plants
T ₁	Ajwa	8	11	19
T ₂	Amber	8	-	8
T ₃	Barhee	8	12	20
T ₄	Khalas	8	11	19
T ₅	Khudri	8	-	8
T ₆	Nabt-ul-Saif	8	-	8
T ₇	Sugai	8	-	8
T ₈	Shishi	8	11	19
T ₉	Sultana	8	-	8
T ₁₀	Medjoul	-	14	14
T ₁₁	Lulu	-	12	12
T ₁₂	Nemeishi	-	12	12
T ₁₃	Raziz	-	11	11
T ₁₄	Zamli	-	11	11
Total				177

Table.7: Vegetative and reproductive attributes of exotic date palm cultivars planted Bahawalpur station

Variety	Survival (%)	Av. Plant Height (m)	Av. No. of fronds	Av. Frond Length (m)	Av. No. of Pinnae	Av. No. of suckers / plant	No. of spathes	No. of Bearing Fruit plants
Ajwa	95	2.10	22	2.00	84	2-6	1-7	6
Amber	100	2.25	30	2.23	80	1-5	1-3	7
Barhee	95	2.29	28	2.29	102	3-6	2-5	8
Khalas	95	2.02	26	2.05	84	5-8	1-6	8

Khudrawi	100	2.39	32	1.72	90	5-7	5-6	8
Nabt-ul-Saif	100	2.58	25	2.44	86	2-6	1-4	2
Sugai	100	2.39	28	1.98	84	5-6	0-2	5
Shishi	100	2.24	27	1.99	92	6-10	0-2	3
Sultana	100	2.33	24	2.09	91	2-6	0-1	5
Medjoul	95	0.76	12	0.60	28	0	0	0
Lulu	100	0.88	15	0.83	36	0	0	0
Nemeishi	100	0.86	21	1.03	38	0	0	0
Raziz	100	0.93	19	0.85	34	0	0	0
Zamli	100	0.89	13	0.85	32	0	0	0

Plants of all exotic date palm varieties survived in the field up to 100% success. Plants of Nabt-ul-Saif variety attained maximum plant height (2.58 m), while Khudri has maximum number of fronds (32), while plants of Medjool variety showed minimum plant height (0.76 m) and number of fronds (12) (Table.7). Plants of Nabt-ul-Saif variety attained maximum frond length (2.44 m), while Barhee has maximum number of pinnae (102), while plants of Medjool variety showed minimum frond length (0.60 m) and number of pinnae (28) (Table.7). Plants of Shishi variety emerged maximum suckers (6-10) and Khudri variety showed maximum number of spathes (5-6), while plants of Amber variety showed minimum No. of suckers (1-5) and variety Sultana showed minimum spathes (1) (Table.7).



Fig.50: Sugai exotic date cultivar on fruit development stage on 24.06.2019, planted at experimental site of HRS, Bahawalpur



Fig.51: Khalas exotic date cultivar on fruit development stage on 24.06.2019, planted at experimental site of HRS, Bahawalpur



Fig.52: Ajwa exotic date cultivar on fruit color breaking stage on 24.06.2019, planted at experimental site of HRS, Bahawalpur

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Urdu Articles:

Sr. No.	Topic of Article	Date of Publication	Magazine
1.	Care and harvesting of Date palm orchards	15-31 July, 2018	Zarat Nama
2.	Propagation of Date Palm	15-31 August, 2018	-do-
3.	Cultivation of litchi	15-30 September, 2018	-do-
4.	Recommendation for establishment of new orchards	1-15 October, 2018	-do-
5.	Protection of fruit plants and nurseries from frost	1-15 December, 2018	-do-
6.	Care of Date palm orchards	15-31 December, 2018	-do-
7.	Pollination in	15-31	-do-

	Date palm	January, 2019	
8.	Layout of new orchards in Punjab	1-15 March, 2019	-do-

Radio Talks/TV Talks

Sr. No.	-pic of Radio/TV Talk	Date	Channel
1.	High Density plantation of Guava	13-02-2019	City 41
2.	Propagation of Guava through soft wood cutting techniques	13-02-2019	City 41
3.	Merits of High Density plantation in Guava	13-02-2019	City 41
4.	Recommendations for Orchards irrigation in winter season	04-12-2018	Radio Pakistan/ Agri. Program

National/ International Trainings/ Workshops:

S.#.	Name of training	Name of Participant	Duration	Name of Training Institute/ Organization
1.	Implementation of Procurement management information system	Javaid Iqbal, Muhammad Maaz Aziz	03.12.18 to 04.12.18	RADEC, Vehari
2.	Emerging Technologies in Research Advanced MS Office and Digital Resources.	Dr. Maryaam, Qamar Shahzad Anjum	24.09.18 to 25.09.18	Library, AARI, Faisalabad
3.	HRM.data portal	Sitwat Riaz	12.11.18	PITB, Lahore

Participation in National/ International Conferences/ Seminars/ Meetings/ Exhibition:

• Farmer day/Farmer Training

S.#	Title	Date	Location	No. of Participants
1.	Advance production technologies of	13.12.2018	Chak #366/JB, Gojra,	100

Guava Pomegranate and Date palm in present climate change scenario.		Distt. Toba teksingh.	
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