



Research Article

Performance of Exotic Germplasm of Date Palm Under the Climatic Conditions of Central Punjab, Pakistan

Muti Ullah^{1*}, Muhammad Kashif Raza¹, Muhammad Zahid Rashid², Amina², Maryam Nasir² and Zaid Mustafa³

¹Date Palm Research Sub Station, Jhang, Punjab, Pakistan; ²Horticultural Research Institute, AARI, Faisalabad, Punjab, Pakistan; ³Department of Agricultural Sciences, Allama Iqbal Open University, Islamabad, Pakistan.

Abstract | Date palm is third major fruit in Pakistan after citrus and mango in respect of area and production. Existing germplasm of dates having more 300 varieties have no export potential. Study of exotic and promising germplasm under central Punjab condition is a need of the date industry. For this purpose, date palm tissue cultured suckers of Ajwa, Amber, Barhee and Khudri were investigated for morphological and biochemical attributes under agro climatic conditions of central Punjab. Result regarding plant height (cm) and number of fronds were found maximum in Ajwa cultivar, while maximum suckers were observed in Khudri. Reproductive parameter spathe per plant was noted maximum (8.5) in Amber followed by khudri (7.2). In case of yield/plant, maximum yield was noted in case of Amber (35.93Kg) trailed by khudri (33.70 Kg) and Barhee (29.12 Kg) whereas lowest yield was observed in ajwa (26.12Kg). The highest percentage of TSS was found in Ajwa (47.03 %) followed by Amber (39.93%), Barhee (31.6 %) while lowest TSS was noted in cultivar Khudri (28.1 %). Our results depicted that morphological and biochemical parameters are very useful to assess the performance of different date palm cultivars for commercial cultivation and germplasm conservation.

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***Correspondence** | Muti Ullah, Date Palm Research Sub Station, Jhang, Punjab, Pakistan; **Email:** matee3761@gmail.com

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Keywords | Ajwa, Exotic germplasm, Fronds, Spathe, Spiklets, TSS



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Introduction

Pakistan is a major producer of dates and the date palm is one of the country's most important cash crop by occupying an area of 94866 hectares with annual production 228555 tons. Pakistan has exported the fresh and dried dates 97964 tons and imported 54754 (Fv and CS, 2022-23). 300 cultivars of date palm have been grown with different genetic

makeup regarding morphological and biochemical feature in Pakistan (Markhand *et al.*, 2010; Sakr *et al.*, 2010). Date palm varieties are unique in their botanical and fruit characteristics (Suleiman *et al.*, 2012) but only few cultivars have been characterized in response to morphological and botanical characters (Hamad *et al.*, 2015). Plant morphological characters are greatly influenced due to changes in traits due to interactions among genotype and environments

(Haider *et al.*, 2015). Many variants were transferred to regions outside of their native areas where grown with different names resulting same variety having different names in various growing regions (Amira *et al.*, 2011; Abul-Soad *et al.*, 2013). Temperature and precipitation is main climatic factor that influences fruit quality of dates (Maryam *et al.*, 2015). Fruit quality was greatly influenced by cultural practices and environmental conditions of cultivated areas (Qadri *et al.*, 2016). Several scientists worked on the evaluation of different date palm cultivars under different climatic zones of different countries (Osman, 2008). However, there is limited information regarding adaptability, evaluation, and performance of exotic date palm cultivars in Punjab, Pakistan. The existing cultivated date palm varieties including Aseel, Hilawi, Khudrawi and Zaidi cannot meet the export potential. Thus, addition of exotic germplasm of date palm in Pakistan is the need of day. Keeping in view, this study was planned in which the performance of exotic germplasm was evaluated with objective to find the adaptation ability, morphological, biochemical attributes and yield of these cultivars under agro climatic conditions of central Punjab, Pakistan.

Materials and Methods

The present study was executed at Date Palm Research Sub-station, Jhang during the year 2022-23, Pakistan, at geographical latitude of 31.27 and longitude of 72.33. Date palm suckers of one-year age were initially brought from UAE and acclimatized under agro climatic condition of Central Punjab, Jhang. Further, the uniform sized six-year old plants of four date palm cultivars Ajwa, Amber, Barhee and Khudri were selected for study. Experiment was laid according to Randomized Complete Block Design (RCBD) with three replications of each treatment. All cultural and nutritional practices were adapted according to the requirement of the crop.

Morphological parameters

The height of three plants in each treatment was measured with measuring tape and mean value was calculated ((Figure 1)). The number of fronds per plant, leaflets per leaf, spathe per plant, spikelet per spathe and suckers per plants were counted and average was calculated. The width and length of ten fruits was measured in each treatments using vernier caliper. Fruit weight (gram) and stone weight (gram) was measured by using electric weight balance.

Biochemical attributes

Total soluble solids were measured with digital portable Kyoto electronics manufacturing by placing a drop of fruit juice on prism at room temperature and expressed in Brix. For measurement of juice acidity, 10 ml fruit juice was titrated against sodium hydroxide (NaOH) using phenolphthalein as indicator, and acidity was measured according to method described by Shireen *et al.* (2018).

Yield-related parameters

The fruit per spikelet, bunch weight and yield per plant was calculated measuring weight on electric balance and mean of three replicates was calculated.

Statistical analysis

Data was statistically analysed using statistical software Statistix 8.1 collected data was subjected to analysis of variance (ANOVA) and average values were compared using least significant difference (LSD) test at $P \leq 0.05$ (Steel *et al.*, 1997).

Results and Discussion

Morphological performance

According to our results presented in graph-1, Vegetative parameters Plant height (477.17 cm) was calculated maximum trailed by amber (308.87 cm) while minimum height was attained in Khudri (205.97 cm). Maximum number of fronds per plant (12.80) and highest leaflets per leaf was observed in Amber and Ajwa, respectively. In case of other three cultivars, no significant difference in number of fronds was observed. Khudri cultivar produced maximum suckers per plant. The alternate growth pattern of leaflets distribution was noted in all cultivars. All the exotic germplasm best suited to agro climatic condition of central Punjab. all cultivars were found vigorous and healthy under central Punjab Conditions of Jhang. These results are similar to finding of Saod *et al.* (2013) who worked on adaptability of different exotic cultivars and evaluated the performance under the climatic condition of Khairpur.

Reproductive parameters

The results of the reproductive behavior of exotic cultivars under central Punjab condition are presented in graph-2. Reproductive parameters regarding, spath per plant, number of spikelet's in one spath, spikelet's length and number of fruits per spikelet's were observed maximum in Amber cultivar followed by

Table 1: *Fruit Biochemical attributes of exotic cultivars.*

Cultivars	Fruit weight (g)	Fruit length (mm)	Fruit width (mm)	Stone weight (g)	Pulp ratio (%)	TSS (Brix°)	Acidity (%)
Ajwa	11.3 b	32.7 b	23.9 b	1.2 a	88.4 b	47.0 a	0.14 d
Amber	21.6 a	50.5 a	27.7 a	1.2 a	94.1 a	39.9 b	0.55 c
Barhee	6.3 c	27.5 c	21.5 b	0.9 b	84.7bc	31.6 c	0.75 b
Khudri	5.0 c	27.9 c	17.7 c	0.9 b	81.1 c	28.1 d	0.84 a

Khudri, except number of spikelet in one spath that were less in Khudri. Similarly maximum bunch weight and yield per plant was noted in Amber and Khudri. Results were found same in line with findings of [Iqbal et al. \(2014\)](#) who reported the variation in fruit size length and width occurred due to genetic makeup of cultivar. Results were also agreed with ([Rezazadeh et al., 2013](#)) who worked on metaxenia effects on date palm.

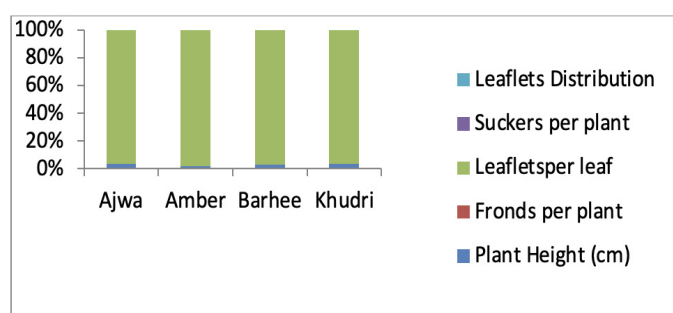


Figure 1: *Morphological parameters of exotic cultivars.*

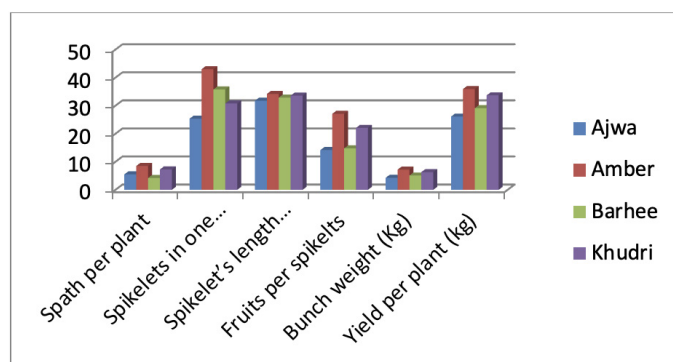


Figure 2: *Reproductive parameters of exotic cultivars*

Biochemical attributes

According to results presented in [Table 1](#), maximum fruit weight (21.6 g), fruit length (50.6mm), width (27.7 mm), stone weight (1.2 g) and pulp ratio (94.1%) was recorded in Amber followed by Ajwa. Minimum fruit weight and fruit length was observed in Barhee and Khudri. Highest TSS of fruit juice was calculated in Ajwa (57.0°) followed by Amber (39.9°). Minimum TSS of 31.6° and 28.1° was recorded in Barhee and Khudri, respectively. Our results are similar with the

findings of [Asif et al. \(1982\)](#) who worked on different exotic cultivars, recorded physical parameters and no major variation found in comparison with native place. However, little variations in fruit characters might be associated with environmental associated soil characteristics, pollen quality and plant vigor ([Jaradat, 2011](#)). In our study, highly significant variation observed among different date palm strains and their ripening stages. The total soluble solids and acidity was negatively correlated. These results are in line with the findings of [Amira et al. \(2012\)](#) who reported the gradual decrease of tannin presence during ripening stage.

Conclusions and Recommendations

The superior cultivars of this study can serve as a genetic resource for future crop improvement programs and conservation of gene bank of date palm for future studies.

Acknowledgments

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Novelty Statement

No Research work has been conducted on varietal performance of exotic cultivars under the agro climatic condition of Central Punjab especially Jhang area.

Author's Contribution

Muti Ullah: Main author conducted the experiment.
Muhammad Kashif Raza: Helped in biochemical study work.

Muhammad Zahid Rashid and Amina: Helped in research experiment and statistical work.

Maryam Nasir: Assisted in removal of plagiarism

and reference.

Ali Sher: Assisted in Research trail design.

Zahid Mustafa: Review the experiment work.

Conflict of interest

The authors have declared no conflict of interest.

References

- Abul-Soad, A.A., M.A. Jatoti and G.S. Markhand 2013. Performance of three Saudi Arabian date palm varieties under the agro-climatic conditions of Khairpur. Pak. J. Agric. Sci., 50(4): 571-576.
- Amira, E.A., G. Flamini, L. Manel, F. Ali, H. Mohamed, H.A. Noureddine and A. Lofti. 2011. Chemical and aroma volatile composition of datepalm (*Phoenix dactylifera* L.) fruits at three maturation stages. Food Chem., 127: 1744-1754. <https://doi.org/10.1016/j.foodchem.2011.02.051>
- Amira, E.A., S.E. Behija, M. Lamia, L. Manel, I.H. Mohamed and A. Lotfi. 2012. Effects of the ripening stage on phenolic profile, phytochemical composition and antioxidant activity of date palm fruit. J. Agric. Food Chem., 60(44): 10896-10902. <https://doi.org/10.1021/jf302602v>
- Asif, M.I., O.A. Al-Tahir and M.S. Al-Kahtani. 1982. Inter-regional and inter-variety variations in dates grown in the Kingdom of Saudi Arabia. Proceedings of the first symposium on the date palm. 23-25 March, King Faisal University, Al-Hassa, Saudi Arabia. pp. 234-248.
- Fruit, Vegetables and Condiments Statistics of Pakistan 2022-23. Ministry of national food security and research Islamabad. Available online with updates at www.mnfsr.gov.pk
- Haider, M.S., I.A. Khan, M.J. Jaskani, S.A. Naqvi, M. Hameed, M. Azam and J.C. Pintaud, 2015. Assessment of morphological attributes of date palm accessions of diverse agro-ecological origin. Pak. J. Bot., 47(3): 1143-1151.
- Hamad, I., H.A. Elgawad, A.A. Jaouni, G. Zinta, H. Asard, S. Hassan, M. Hegab, N. Hagagy and S. Selim. 2015. Metabolic analysis of various date palm fruit (*Phoenix dactylifera* L.) cultivars from Saudi Arabia to assess their nutritional quality. Molecules, 20: 13620-13641. <https://doi.org/10.3390/molecules200813620>
- Hasnaoui, A., M.A. Elhoumaizi, C. Borchani, H. Attia and S. Besbes. 2012. Physicochemical characterization and associated antioxidant capacity of fiber concentrates from Moroccan date flesh. Indian J. Sci. Technol., 5: 2954-2960. <https://doi.org/10.17485/ijst/2012/v5i7.4>
- Iqbal, M., S.A. Jatoti, M. Niamatullah, M. Munir and I. Khan. 2014. Effect of pollination time on yield and quality of date fruit. J. Anim. Plant Sci., 24(3): 760-764.
- Jaradat, A.A., 2011. Biodiversity of date palm. In: Encyclopedia of life support systems: Land use, land cover and soil sciences. Eolss Publishers, Oxford, UK.
- Markhand, G.S., A.A. Abul-Soad, A.A. Mirbahar and M.A. Kanhar, 2010. Fruit characterization of Pakistani dates. Pak. J. Bot., 42(6): 3715-3722.
- Maryam, M., B. Fatima, M.S. Haider, S.A. Naqvi, M. Nafees, R. Ahmad and I.A. Khan. 2015. Evaluation of pollen viability in date palm cultivars under different storage temperatures. Pak. J. Bot., 47(1): 377-381.
- Osman, S.M., 2008. Fruit quality and general evaluation of Zaghloul and Samany date palms cultivars grown under conditions of Aswan. Am. Eurasian J. Agric. Environ. Sci., 4: 230-236.
- Qadri, R.W.K., S. Waheed, M.S. Haider, I. Khan, S.A., Naqvi, M. Bashir and M.M. Khan. 2016. Physicochemical characterization of fruit of different date palm (*Phoenix dactylifera* L.) varieties grown in Pakistan. J. Anim. Plant Sci., 26(5): 1268-1277.
- Rezazadeh, R., H. Hassanzadeh, Y. Hosseini, Y. Karami and R.R. Williams. 2013. Influence of pollen source on fruit production of date palm (*Phoenix dactylifera* L.) cv. Barhi in humid coastal regions of southern Iran. Sci. Hortic., 160: 182-188. <https://doi.org/10.1016/j.scienta.2013.05.038>
- Sakr, M.M., I.A. Zeid, A.E. Hassan, A.G.I.O. Baz and W.M. Hassan. 2010. Identification of some Date palm (*Phoenix dactylifera*) cultivars by fruit characters. Indian J. Sci. Technol., 3(3): 338-343. <https://doi.org/10.17485/ijst/2010/v3i3.24>
- Shabani, F., L. Kumar and S. Taylor. 2012. Climate change impacts on the future distribution of date palms: A modeling exercise using Climex. PLoS One, 7(10). <https://doi.org/10.1371/journal.pone.0048021>

- Shireen, F., M.J. Jaskani, M.A. Nawaz and F. Hayat. 2018. Exogenous application of naphthalene acetic acid improves fruitsize and quality of Kinnow mandarin (*Citrus reticulata*) through regulating fruit load. J. Anim. Pl. Sci., 28(4): 1080-1084.
- Steel, R.G.D., J.H. Torrie and D.A. Dickey. 1997. Principles and procedures of statistics, A biometrical approach. 3rd edition. McGraw Hill Book Co. New York, pp. 352-358.
- Suliman, A.M.E., A.A. Elhafise and A.M. Abdelrahim 2012. Comparative study on five sudanese date (*Phoenix dactylifera* L.) fruit cultivars. Food Nutr. Sci., 3: 1245-1251. <https://doi.org/10.4236/fns.2012.39164>