



Research Article

Performance Evaluation of Papaya Genotypes in Nepal

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Article Information

Received: 02 October 2022

Revised version received: 15 December 2022

Accepted: 18 December 2022

Published: 30 December 2022

Cite this article as:

JN Chaudhary et al. (2022) Int. J. Appl. Sci. Biotechnol. Vol 10(4): 221-224. DOI: [10.3126/ijasbt.v10i4.50883](https://doi.org/10.3126/ijasbt.v10i4.50883)

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Peer reviewed under authority of IJASBT

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Biotechnology

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Keywords: Papaya, genotypes, performance, location and yield

Abstract

Coordinated varietal trials (CVTs) were conducted to identify the high yielding papaya (*Carica papaya* L.) genotypes at different agro-climatic conditions with eight genotypes at Agriculture Research Station (ARS), Malepatan, Pokhara; Viuran, Nawalparasi and Parewatar, Dhading during 2006-2009 and seedling were transplanted at the time of October and experiment was designed in RCBD and replicated thrice. Observations were recorded on biological and socio-economic parameters and analyzed. The pooled data over year revealed that number of fruits, marketable yield, average weight and circumference of the fruits at ARS, Malepatan and marketable fruit yield and average weight of the fruit at Viuran, Nawalparasi and Parewatar, Dhading showed the highly significant differences among the tested genotypes. Days to first harvest and length of the fruits at ARS, Malepatan and days to flowering, first harvest and number of fruits per plant at Viuran, Nawalparasi and Parewatar, Dhading showed the significant differences within genotypes. While, non-significant difference was noticed under days to flowering at ARS, Malepatan. Genotypes Red Lady was found early in all location (295 days to harvest) and the highest production of the marketable fruit yield (104.22 t/ha) followed by Farm selection-1 (102.37 t/ha) and which was at par with each other. Farm selection-1 recorded in the highest number of fruits per plant (41.4), the average fruit weight (1.46 kg) followed by Red Lady (37 and 1.37 kg at ARS, Malepatan, Pokhara. Farmers and consumers preferred red Lady due to earliness, red flesh color and good storability.

Introduction

Papaya (*Carica papaya* L.) is a one of the most important tropical and subtropical fruit as well as vegetable. It is commercially grown throughout terai and foot hills/river basin in Nepal. Out of 40 species of *Carica*, only three species are found important for commercial cultivation and the important species grown in Nepal is *Carica papaya*, L. (Thapa, 1990). It has very short gestation period as compared to other fruit crops and yields 70 to 80 mt/ha under ideal management practices and thus gives higher income per unit of area. Papaya is regarded as a good source

of vitamin A and other major and micro-nutrients consumption of which may prevent cancer, diabetes, jaundice and heart disease. Regular consumption of unripe green mature fruit improves the digestive system and acts as a tissue purifier, digestive balancer and free-radical scavenger (SAIC Newsletter, 2002). Realizing these facts, people are changing their food habit and starting to include fruits including papaya as their dietary part that cases increasing trend of papaya consumption which have created higher demand of the fruit in the market.

The productivity of papaya in Nepal during 1993/1994 was 9.97 mt/ha which increased to 12.7 mt/ha in 2017/2018 (MoAC, 2017/18) which indicates the stagnant/very slow increment of Papaya productivity in longer period of time. The demand of papaya fruit has not fulfilled with the internal production. Nepal imported huge quantities of fresh papaya fruits mainly from India and few from Indonesia, Isle of Man and Thailand (MOAC, 2017/18). Beside these, Nepal is also importing large quantity of processed fruits in forms of Jam, Jelly and papain. Reasons behind the less production and lower availability of papaya are limited choice of Papaya varieties to be cultivated and its management practices (Papaya Technical Report, 2009). None of the papaya variety has been recommended for commercial cultivation but few farmers are growing papaya commercially in limited areas with the local or unknown variety. The experiment was conducted to evaluate and select the potential papaya genotypes for commercial cultivation in mid hills and terai regions of Nepal.

Material and Methods

Coordinated Varietal Trial (CVT) using eight different genotypes of papaya was conducted during 2006/07 - 2007/09 in three different agro-ecological regions viz. Agriculture Research Station (ARS), Malepatan, Pokhara (900 masl); Kumpur- 3 Parewatar (600 masl), Dhading and Prasauni-9 Viuran (300 masl), Nawalparasi. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications in each location. The genotypes were collected from different parts of country and few genotypes were brought from abroad via Agro-vet shops. The collected genotypes planted for evaluation were Selection -1, Pusa Dwarf, Honew Dew, Pusa Nanha and Viuran Local (dioecious), Gayak (Chinese genotype), Sweetie (F₁ hybrid) and Red Lady (Female and Hermaphrodite).

The seeds of these varieties were sown in polyethylene bags and 50-55 days age of seedling was transplanted in the main field. Three seedlings per pit was planted for dioecious genotypes viz. Farm Selection -1, Pusa Dwarf, Honew Dew, Pusa Nanha and Viuran Local. After flowering, vigorous female plant in a pit was let to grow and others were removed. Planting was done at the spacing of 1.9 m for row to row and plant to plant. Fertilizers and manures were applied @ 250:250:400 g NO₂:P₂O₅:K₂O per plant, respectively along with 15 kg FYM/plant. One fourth of chemical fertilizer was applied as basal dose and remaining three parts were applied equally during 1st, 3rd and 7th month of transplanting (DAT). All the cultural practices were performed as needed. Observations were recorded on growth, yield and yield contributing characters. The data were analyzed by using Gen-stat and Excel Software package of the computer.

Results

Evaluation of Different Genotypes of Papaya at Horticulture Research Station, Malepatan During 2006/07 To 2008/09

The results of the experiment on the evaluation of papaya genotypes at Agriculture Research Station (ARS), Malepatan, Pokhara in 2006/07 and 2008/09 has been given in Table 1. The results showed that there is significant genotypic variation in terms of yield and yield attributing parameters although the days to flowering was observed as no-significant among genotypes.

Days to Flowering

The number of days to first flowering after transplanting of seedlings varied from 189 to 213 days which was found non-significant among genotypes.

Days to First Harvest

Days to first harvest of mature fruits among genotypes was found significant. Few genotypes were found earlier than others. The result showed that the earliest (295 Days after Transplanting) harvesting was started in genotype Red Lady and Chinese Gayk (F₁ hybrid) (297 days) which were found at par. Similarly the late harvest was noticed in Viuran Local (328 days). Genotypes like Pusha Dwarf, Farm Selection, Honey Dew, Pusha Nanha are similar to give first harvest.

Number of Fruits/Plant

The result showed that there is significant different among different genotypes tested to yield number of fruits per plant. The highest number of fruits (41.4) was recorded in genotype farmer's Selection-1 which was followed by Red Lady (37.0), Pusa Nanha (32.6), Pusa Dwarf (31.4) Sweetie (28.9), Viuran Local (27.2), and minimum was recorded in genotypes Chinese Gayk (20.1) and Honey Dew (19.3).

Average Weight (Kg) Fruit

The average weight of fruit (gram) in different genotypes was found significantly different. The highest fruit weight (1.46 kg) was found in genotype Farmer's Selection-1 which was followed by Red lady (1.37 kg), Viuran Local (1.25 kg), Pusa Dwarf (1.23 kg), Sweetie (1.19 kg), Gyak (1.07 kg), Pusa Nanha (1.02 kg) and minimum in Honew Dew (0.74 kg).

Average Length (cm) of Fruit

Similarly average length (cm) of fruit varied from one genotype to another. The length varies from 25.66 to 16.70 cm. The Longest (25.66 cm) fruit was recorded from genotype Chinese Gyak whereas it was shortest (16.7 cm) in genotype Pusa Nanha.

Average Circumference (cm) of Fruit

The circumference of fruits from all genotypes was found significantly different. The highest circumference (46.37 cm) was observed in fruits from genotype Farmer's Selection-1 which was followed by genotype Viuran Local

(44.89 cm) which were statistically at par. The genotype Honey Dew had the fruits with minimum circumference (31.7 cm). Fruits of other genotypes had statistically similar circumference measure which ranged from 36.52 to 39.41 cm.

Marketable Yield (mt/ha) of Fruit

The result revealed that the marketable yield (mt/ha) significantly varied among different genotypes of papaya tested. The highest marketable fruit yield (104.22 mt/ha)

was recorded in genotype Red Lady which was followed by Honey Dew (102.37 mt/ha), Sweeti (91.73 mt/ha) and Farmer's Selection (85.72 mt/ha). The marketable yield was found minimum in Pusa Dwarf (50.25).

Similar experiment was conducted at Nawalparasi (Terai region) and Dhading (Foot hills) to evaluate the performance of the papaya genotypes. The results of the evaluation have been given in Table 2.

Table 1: Evaluation of different genotypes of Papaya at Horticulture Research Station, Malepatan during 2006/07 to 2008/09

Cultivars	Types of cultivars	Days to flower	Days to 1 st harvest	No. of fruit/plant	Marketable Yield (t/ha)	Av. wt of fruit (Kg)	Length of the fruit (cm)	Circumference of the fruit (cm)
Chinese (Gayk)	F ₁ Hybrid	189	297	20.1	77.13	1.07	25.66	39.41
Sweetie	F ₁ Hybrid	193	302	28.9	91.73	1.19	21.65	37.09
Red Lady	Female & hermaphrodite	190	295	37.0	104.22	1.37	22.87	38.73
Pusa Dwarf	Dioecious	208	321	31.4	50.25	1.23	18.44	36.52
Honey Dew	Dioecious	199	317	19.3	102.37	0.74	20.1	31.75
Farm Selection-1	Dioecious	208	325	41.4	85.72	1.46	23.58	46.37
Pusa Nanha	Dioecious	211	324	32.6	70.96	1.02	16.7	39.18
Viuran Local	Dioecious	213	328	27.2	77.13	1.25	24.81	44.89
F-test		ns	*	**	**	**	*	**
LSD		-	22.42	6.60	18.30	0.14	5.4	4.19
CV (%)		6.4	4.1	13.2	13.1	6.8	14.3	6.1

Table 2: Evaluation of different genotypes of Papaya in Parewatar, Dhading and Viuran, Nawalparasi during 2006/07 to 2008/09

Cultivars	Types of cultivars	Days to flowering	Days to 1 st harvest	No. of fruit/plant	Yield (t/ha)	Av. wt of fruit (Kg)
Chinese (Gayk)	F ₁ Hybrid	217	325	20.0	56.4	1.10
Sweetie	F ₁ Hybrid	220	329	25.7	82.2	1.17
Red Lady	Female & hermaphrodite	219	324	32.7	111.0	1.28
Pusa Dwarf	Dioecious	231	344	34.3	114.7	1.24
Honey Dew	Dioecious	220	338	24.3	45.5	0.83
Farm Selection-1	Dioecious	230	347	32.0	117.4	1.59
Pusa Nanha	Dioecious	232	345	33.3	90.7	1.11
Viuran Local	Dioecious	235	350	33.3	110.5	1.34
Grand Mean		225	338	29	89.80	1.21
F-test		*	*	*	**	**
LSD		13.21	18.47	7.6	10.36	0.28
CV (%)		3.3	3.1	14.8	10.7	13.3

Days To Flowering After Transplanting

The result revealed that there is significant ($P < 0.05$) variation in early and late flowering among tested genotypes. The earliest flowering was observed in Chinese genotype Gayk which flowered at 217 days after transplanting which was followed by Red Lady (219 days), Honey Dew and Sweeti (220 days) and were found statistically at par. Significantly late flowering was observed in Viuran local (235 days) which was followed by Pusa Nanha (232 days), Pusa Dwarf (231 days) and Farm Selection (230 days).

Number Of Fruits/Plant

There is a significant variation among tested genotypes for bearing number of fruits. The total number of fruits per plant was found highest (34.3) in Pusa Dwarf followed by Viuran Local (33.3), Pusa Nanha (33.3) Red Lady (32.7) and Farm Selection-1 (32.0). The lowest number of fruits (20) per plant was recorded in genotype Gayk followed by Honey Dew (24.3) and Sweeti (25.7) which were statistically at par.

Average Fruit Weight (Kg)

The average fruit weight (kg) was found highest (1.59 kg) in genotype farm Selection-1 which was followed by Viuran Local (1.34 kg), and Red Lady (1.28 kg) which were found statistically at par. Similarly smallest (0.83 kg) fruits in terms of weight were recorded in genotype honey dew followed by Gyak (1.10 kg) and Pusa Nanha (1.11 kg).

Total Yield (mt/ha)

There is significant difference in the total yield (mt/ha) among genotypes. The results of the experiment revealed that the highest yield (117.4 mt/ha) was found in genotype farm Selection-1 which was followed by Pusa Dwarf (114.7 mt/ha), Red Lady (111.0 mt/ha) and Viuran Local (110.5 mt). The lowest (45.5 mt/ha) was found in genotype Honey Dew.

Discussion

The overall performance of Red Lady genotypes was found superior in terms of early production of fruit, number of fruits, high yielding, average weight, and circumference of the fruits in all locations followed by farm selection-1 while poor performance was recorded in Honey Dew and Chinese genotype Gayk. Therefore, Red lady is very popular among the farmers and cultivated throughout commercial growing areas due to its capacity bear fruits in 99 percent plants, early, dwarfness stature, high yielding, and good fruit quality (uniform ripening, tight out layer surface, good storability, marketable size, taste, red pulp and sweet) and has potential to fulfill the demand of our markets fruit quality and quality for exporting. These results were in close confirmation with Jana *et al.* (2010), Ara *et al.* (2013) and Meena *et al.* (2016).

Conclusion

Farm Selection -1 produced the highest yield and observed wider adaptability throughout commercial growing areas of papaya and Red Lady genotype is female and hermaphrodite line which has capacity of bearing fruits in 99 percent plants and gave significantly higher yield, good fruit quality (uniform ripening, tight outer layer surface, good storability, marketable size, taste, red pulp and sweet) and also observed virus diseases resistant capacity in some extent. Therefore, based on result Farm selection -1, and Red lady are recommended for commercial papaya cultivation for getting higher yield as well as income..

Acknowledgement

We are grateful to NARC and NARDF for providing funding and allowing to work in this project. Our gratitude and thanks are due to Ms S Joshi Pathology Research Division, Khumaltar; and Dr EM Bhattarai, Mr R.B. Basnet Mr. R. Yadav and Mr. R.P.. Paudel of DoAR, Lumle for their help to achieve the outputs of the project.

Authors' Contribution

JN Chaudhary concept and designed the research, took field data, analysed and interpreted the data, draft the manuscript; IP Gautam, YR Bhusal and T Gotame comments the manuscripts for its improvement and JN Chaudhary, IP Gautam, YR Bhusal and T Gotame finally approved the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest.

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