

Research Article

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Response of chemical and physical mutagens on yield of papaya (*Carica papaya* L.)

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ABSTRACT : An experiment was conducted at Horticulture Garden, Department of Horticulture, C.S. Azad University of Agriculture and Technology, Kanpur during two consecutive year. The main objective was to produce qualitative and quantitative fruits yield of papaya for fetching good return with use of chemical and physical mutagens. The maximum fruit yield of papaya was recorded by 24.86 kg/plant with the use gamma irradiation 10 kr, followed by control (24.01 kg/plant). Application of EMS mutagen @ 0.2% and 0.4% gave fruits by 18.38 kg/plant and 18.64 kg/plant, respectively. It is worth while to mention here that the lower doses of chemical and physical mutagens use on papaya gave better response over the higher doses. The growth and yield trails was found in concordance to fruits yield of papaya.

KEY WORDS : Chemical mutagene, Chemical substance, Nutritional need, Physical mutagene

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INTRODUCTION

Papaya (*Carica papaya* L.) has been one of the most important and popular fruits grown in India. India is the largest producer of papaya in the world. It is cultivated in about all part of country. Being one of the richest source of vitamin B and C papaya usually stands next to mango in area and production (Anand and Bhattacharaya, 1964).

Area and production have increased sharply within last few decades owing to its wide range of adaptability and increased demand for fruits. During recent years the processed food products has increased and several products are being made in our country. Thus, the manufacture and consumption

of the processed food products furnished nutritional needs of the population of supplying by quantity and quantitative throughout the year in modern era mutation is used for making improvement in different fruit plants. Papaya also deserves its improvement through mutation, which may provide fruitful and desirable results. Therefore, the chemical mutagen and gamma irradiation are thought to bring desirable improvements in papaya. Mutagens are the chemical substances, which induce mutation in plants or any other organism. Different mutagens are being used for improving various fruit crops. Chemical mutagens include alkylating agents like Ethyle Methanosulphonate (EMS), acridine dyes like proflorine base analogies S-chlorouratic and other like nitrous acid, hydroxyle amine etc.

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EXPERIMENTAL METHODS

The experiment was laid out during two consecutive years at Horticulture Garden, Department of Horticulture, C.S. Azad University of Agriculture and Technology, Kanpur, which was situated at the side of main road for making approach easily.

Table 1: Growth, yield traits and yield of papaya/plant as influenced by chemical and physical mutagens (pooled data of two years)

Sl. No.	Treatments	Height/plant (cm)	Leaves/plant	Fruits/plant	Diameter of fruits/plant (cm)	Weight/fruit (kg)	Fruit yield/plant (kg)
1.	Gamma irradiation 1 kr (T ₁)	76.83	18.66	47.76	19.86	1.55	23.26
2.	Gamma irradiation 5 kr (T ₂)	78.99	16.33	50.08	21.83	1.44	23.36
3.	Gamma irradiation 10 kr (T ₃)	82.00	13.50	52.18	22.08	1.60	24.86
4.	Gamma irradiation 15 kr (T ₄)	68.83	11.16	40.33	20.08	1.32	20.19
5.	Gamma irradiation 20 kr (T ₅)	66.83	9.50	25.08	14.86	1.00	10.09
6.	Gamma irradiation 25 kr (T ₆)	61.83	8.16	19.00	Plant died	Plant died	Plant died
7.	EMS mutagen 0.2% (T ₇)	73.33	17.66	35.19	19.41	1.31	18.38
8.	EMS mutagen 0.4% (T ₈)	76.50	15.16	29.54	20.33	1.28	18.64
9.	EMS mutagen 0.6% (T ₉)	71.83	12.33	23.71	16.20	1.30	10.38
10.	FMS mutagen 0.8% (T ₁₀)	66.00	9.66	16.94	Plant died	Plant died	Plant died
11.	EMS mutagen 1.0% (T ₁₁)	62.16	7.16	Plant died	Plant died	Plant died	Plant died
12.	EMS mutagen 1.2% (T ₁₂)	60.16	6.00	Plant died	Plant died	Plant died	Plant died
13.	Control (T ₁₃)	70.83	12.50	46.98	20.00	1.32	24.01
	C.D. (P=0.05)	6.31	2.72	8.87	3.72	0.37	2.80

The soil of the experimental field was loam and it was marked to the well fertile for the garden crops. The treatment consisted of gamma irradiation 1 kr, gamma irradiation 5 kr, gamma irradiation 10 kr, gamma irradiation 15 gr, gamma irradiation 20 kr, gamma irradiation 25 kr, EMS mutagen 0.2 per cent, EMS mutagen 0.4 per cent, EMS mutagene 0.8 per cent, EMS mutagene 1.0 per cent, EMS mutagene 1.2 per cent and control. Gamma irradiations (kr) were applied to papaya seeds. Similarly, different treatments of EMS mutagens were used with pre-soaking of seeds. Coorg Honey Dew famous variety of papaya was selected for the present investigation. Healthy seeds of above variety were procured and sown in the nursery beds after proper treatment. The papaya nursery plants were planted in the experimental field at recommended time and ripe fruits were plucked. The recommended package of practices were followed in papaya. The trial was laid out in a Randomized Block Design with three replications.

EXPERIMENTAL RESULTS AND ANALYSIS

Treatments of gamma irradiation and EMS showed its effect on different parameters of papaya plant has given in Table 1. The pooled results of two year experiment have discussed below.

Effect on growth parameters :

Height of plants measured at 120 days indicated that both mutagens affected the plants height. It was found to be great variable and varied from 60.16 cm (EMS mutagen 1.2%) to 82.00 cm (Gamma irradiation) 10 kr. The minimum height was measured with use of EMS mutagen 1.2 per cent, while maximum was found with Gamma irradiation 10 kr. The variation in plant height after greater period of growth has also been observed by Prasad (1985). The maximum number of leaves was found 18.66 in Gamma irradiation 1 kr closely followed by 17.66 in EMS mutagen 0.2 per cent. The minimum number of leaves/plant was count with the application of EMS mutagen 1.2 per cent (6.00). Similar observations have also been recorded by Omg and Kwok (1983).

Effect on yield traits :

Number of fruits produced was found variable as per different treatments and ranged from nil in EMS 1.0 per cent and 1.2 per cent to 52.18 Gamma irradiation 10 kr. Verma (1999) has also observed this trend due to varying treatments. The diameter of papaya fruits ranged from nil in the use of Gamma irradiation 25 kr, EMS mutagen 0.8 per cent, 1.0 per cent and 1.2 per cent to 22.08 cm in Gamma irradiation 10 kr. Observations of the present trials indicated that higher dose of gamma irradiation and EMS mutagen adversely affected to the diameter of papaya

fruits. Present results are in conformity with the findings observed by Yaqub *et al.* (1985). Some of the investigators have also gave the observations of defaced fruits production in higher concentrations of chemical treatments (Rao *et al.*, 1992).

Under the application of Gamma irradiation, weight per fruit ranged from nil in the treatment of Gamma irradiation 25 kr to 1.60 kg/fruit in Gamma irradiation 10 kr. Similarly, application of EMS mutagen weight/fruit ranged from nil in EMS mutagen 0.8 per cent, 1.0 per cent and 1.2 per cent to 1.31 in EMS mutagen 0.2 per cent. Rao *et al.* (1992) also reported similar results.

Effect on fruits yield :

The maximum fruits yield of papaya/plant was found 24.86 kg in gamma irradiation 10 kr followed by control (24.01 kg/plant). Use of EMS mutagen 0.4 per cent gave fruits yield per plant by 18.64 kg closely followed by EMS mutagen 0.2 per cent (18.38 kg/plant). The highest number of fruits per plant, more diameter of fruits/plant and maximum weight/fruit also supported to the highest yield per plant under the use gamma irradiation 10 kr. The results of Bhattacharya and Rao (1981) supported to the present findings.

Conclusion :

The physical mutagen gamma irradiation 10 kr showed positive response on fruits yield of papaya. Therefore, it can be suggested for qualitative and quantitative production of papaya fruits.

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