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Effect of Washing and Non-Washing of Seeds on Germination of Papaya Seedling (*Carica papaya* L.) cv. Pusa Nanha

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Authors' contributions:

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A field experiment was conducted to investigate the response of washing and non- washing of seeds on germination of papaya seedling at the CRC Farm, ITM University, Gwalior (M.P.). The experiment was laid out in the Randomized Block Design using 4 media with or without washing of seeds with tap water comprising 12 treatments combinations (viz., controlled (soil + water), vermiwash (50%) + wood dust, vermiwash (50%) + cocopeat, vermiwash (50%) + pond soil, cow-urine (50%) + wood dust, cow-urine (50%) + cocopeat, cow-urine (50%) + pond soil, vermiwash (100%) + wood dust, vermiwash (100%) + cocopeat, vermiwash (100%) + pond soil, cow-urine (100%) + wood dust, cow-urine (100%) + cocopeat, cow-urine (100%) + pond soil which were replicated thrice. For experimental purpose, freshly ripe fruits of papaya were purchased from the papaya-growing farmer of IARI, New Delhi and seeds were sown in the poly bag (4x24 inch sized).

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The results indicated that the application of Vermiwash (100%) + pond soil recorded minimum days (6.78) required for initiation to germination, minimum days (9.22) required for 50 per cent germination while maximum (100.00) germination percentage in papaya seedlings. Thus, washing of papaya seedlings with vermiwash +pond soil will increase the germination and in turn the production of papaya.

Keywords: Cow-Urine; germination; papaya; pond soil; vermiwash.

1. INTRODUCTION

Carica papaya also called papaw or Pawpaw is a tropical fruit that is part of the Caricaceae family. It grows best in kitchen gardens, backyards, and fields, especially those that are close to large cities or towns [1]. It is one of the few fruit crops that yields early and consistent returns while producing fruit all year long. A papaya's vitamin content is high. For every 100 grams of pulp, it has roughly 2500 IU of vitamin A and 85 mg of vitamin C. It has a significant amount of calcium and other minerals as well. It is very valuable medicinally. The papaya tree is an evergreen that grows quickly and produces fruit continuously. For optimal fruit development and quality, the plant needs well-fertilized soil or growing media. The use of suitable growing media or substrates during seed planting has a direct impact on the germination, development, and functionality of the root system. The fruits can be used to prepare jam, jelly, tutti fruity, marmalade, nectar, wines, and syrup, as well as foods for babies. Growing in popularity among many growers, papaya is a short-duration fruit crop that offers great productivity and profits.

Growing media is a source and a reservoir of plant nutrients in addition to being a site where seeds are sown and seedlings are produced [2]. Additionally, it stabilizes the root system, which supports the plant [3]. According to Wong et al. [4], the quality of seedlings and seed germination are influenced by the growth media composition. Growth media has a direct impact on the germination of seeds, the growth and development of seedlings, and ultimately the upkeep of the highly effective roots system. Nursery potting media influences the quality of seedlings produced [5]. The production of the orchard increased as a consequence of well-established quality seedlings in the field [6]. Sand, pond dirt, organic matter, and soil are the most common materials used to create media for fruit crop seedlings. To provide seedlings with enough nutrients, organic matter (such as Farm Yard Manure and Vermicompost) is applied; cocopeat is regarded as a suitable growth media component, with acceptable pH, electrical conductivity and other chemical attributes [7].

Good physical characteristics of cocopeat include a high total pore space, a high water content, minimal shrinkage, a low bulk density, and a moderate rate of biodegradation. Growing medium is a component of most horticultural production systems. This study includes a variety of growing media, including soil, vermicompost, vermiculite, perlite, cocopeat, etc. Since it is the least expensive and easiest to obtain, soil is typically utilized as a basic medium [8,9]. Organic matter (vermiculite, cocopeat, vermicompost, and perlite) is added to the soil to enrich it with sufficient nutrients for the seedlings, while media is made more porous. A material called a growth medium allows roots to grow forth and take up nutrients and water. The growing medium is crucial for seed germination because it provides essential nutrients for plant growth in addition to serving as support for the plants. [10]. The composition of the medium influences the quality of the seedlings [11]. Similarly, vermicompost is a concoction of humus, organic matter, worm castings, live earthworms, their cocoons, and other species. Water-soluble polysaccharides, humic acid concentration, cation exchange capacity, and the C:N ratio are all increased by earthworms [12]. It can be used as a growing medium to successfully cultivate a variety of agricultural species in the tropics [13]. The creation of a variety of biopesticides and growth promoters that effectively increase soil fertility as well as manage a large number of pests and illnesses in a wide range of groups using cow urine. The biochemical contents of the plants increased with cow urine application. Sawdust can be applied to the base of garden plants to keep roots colder, aid maintain moisture, and keep weeds at bay. Mulch offers all the benefits of wood without the high price tag. Just keep in mind that in order to prevent a nitrogen shortage in the soil, you should also add some nitrogen to your garden. Enzymes that support crop development and productivity are present in the vermiwash, a coelomic fluid extraction method. Vermiwash works great as a foliar spray and is a

great plant tonic. It has high concentrations of nutrients, including calcium, phosphorous, potassium, fungus, auxins, and cytokinins. These nutrients are important for crop production, growth rate, and plant development because they increase soil organic matter and nutrient content, which is easily absorbed by plants. Considering all these aspects, a research study was carried out to study the effect of washing and non-washing of seeds on germination of papaya seedling.

2. MATERIAL AND METHODS

A field experiment was conducted at the Research Farm, ITM School of Agriculture, Gwalior (M.P.). The experimental site is situated at 26°10 N latitude and 78°20´ E longitude at an elevation of 211.52 m above mean sea level falling in the sub-tropical region of India. The climate of this place is bestowed with hot and dry early summers followed by hot and humid monsoon season and cold and dry winters. The soil of the experimental field was sandy loam in texture, with good drainage and uniform texture, slightly alkaline (pH 7.68) in reaction, low in organic carbon (4.5 g/kg) and available nitrogen (19.6 kg/ha) but medium in available phosphorus (19.01 kg/ha) and potassium (241 kg/ha) with electrical conductivity in the safer range. The experiment was laid out in the Randomized Block Design using 4 media with or without washing of seeds with tap water comprising 12 treatments combinations (viz., controlled (soil + water), vermiwash (50%) + wood dust, vermiwash (50%) + cocopeat, vermiwash (50%) + pond soil, cow-urine (50%) + wood dust, cow-urine (50%) + cocopeat, cow-urine (50%) + pond soil, vermiwash (100%) + wood dust, vermiwash (100%) + cocopeat, vermiwash (100%) + pond soil, cow-urine (100%) + wood dust, cow-urine (100%) + cocopeat, cow-urine (100%) + pond soil which were replicated thrice. For experimental purpose, freshly ripe fruits of papaya were purchased from the papaya-growing farmer of IARI, New Delhi and seeds were sown in the poly bag (4x24 inch sized). The observations pertaining to germination characters viz. days required for initiation of germination, days required for 50 percent germination and germination percentage, were recorded after application of treatments. For days required for germination and days to 50 percent germination, seeds after sowing were seen daily and days taken for germination were noted from the date of sowing. Analysis of variance was performed to determine the effect of washing and non-washing of seeds on seed germination of papaya seedlings by using Opstat software. The interpretation of treatment effects was made on the basis of critical difference at 5 % probability level.

3. RESULT AND DISCUSSION

The data presented in Table 1 with respect to seed germination revealed that the interaction of washing viz., (Vermiwash and Cow-urine (50 and 100%) of seeds and different media had

Table 1. Effects of washing and different growing media on germination parameters of papaya cv. Pusa Nanha (*Carica papaya* L.)

Treatment notation	Treatment combinations	Days required for initiation of germination	Days required for 50 percent germination	Germination percentage
T_1	Vermiwash (50%) + wood dust	15.44	18.66	60.00
T_2	Vermiwash (50%) + cocopeat	9.63	11.28	86.67
T_3	vermiwash (50%) + pond soil	8.60	11.08	80.00
T_4	cow-urine (50%) + wood dust	8.21	10.71	93.33
T_5	cow-urine (50%) + cocopeat	11.14	12.89	53.33
T_6	cow-urine (50%) + pond soil	11.28	12.71	73.33
T_7	Vermiwash (100%) + wood dust	10.81	12.14	66.67
T_8	Vermiwash (100%) + cocopeat	7.63	9.99	80.00
T_9	Vermiwash (100%) + pond soil	6.99	9.25	93.33
T_{10}	Cow-urine (100%) + wood dust	6.78	9.22	100.00
T_{11}	Cow-urine (100%) + cocopeat	10.05	13.55	86.67
T_{12}	Cow-urine (100%) + pond soil	9.66	13.14	60.00
S.Em (±)		0.302	0.237	8.020
CD (5%)		0.623	0.489	16.553

significant effect on days required for initiation of germination of seeds, days to 50 per cent germination and germination percentage. The minimum days (6.78) required for initiation to germination, minimum days (9.22) required for 50 per cent germination while maximum (100.00) germination percentage was recorded with the application of Vermiwash (100%) + pond soil followed by Vermiwash (100%) + cocopeat. While, the maximum days required for initiation of germination (15.44), days to 50 per cent germination and lowest germination percentage was recorded in Control (soil + water). This may be due to fact that application of vermiwash increased availability of nitrogen and other nutrients which promote the plant growth by ensuring higher germination percentage with increased photosynthesis and forming longer and stronger roots to absorb sufficient water and nutrients. They also produce the growth promoting substances *viz*., auxin, gibberellin and cytokinin which contributes towards vigorous growth of the plant. Further, these growth promoting substances enhance the yield also. These results are supported by the Kharga et al. [14], Rathod et al. [15], Sharma et al. [16], Singh et al. [17] and Sahu et al. [18].

4. CONCLUSION

It is concluded that application of the Vermiwash (100%) + pond soil significantly influenced the germination of papaya cv. Pusa Nanha (*Carica papaya* L.). Thus, the application of Vermiwash (100%) + pond soil was found to the best treatment among all the treatments and it gave the minimum days of initiation of germination and days to 50 per cent germination and higher germination percentage of seeds which will increase the production of papaya.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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