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Research Article

VEGETATIVE PROPAGATION OF JATROPHA CURCAS L. AND JATROPHA GOSSYPIFOLIA L. BY STEM CUTTINGS

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ABSTRACT

Investigation carried out on vegetative propagation of *Jatropha curcas* L. and *Jatropha. gossypifolia* L. by stem cuttings. It was recorded that the hardwood cuttings was proved significantly effective for percent rooting and more number of leaves in *Jatropha species* as compared to semi hard and soft wood cuttings. Similarly vegetative cutting of length 40 cm showed maximum percent rooting and leaves per cuttings while cuttings with 10cm length showed poor rooting and leaves response.

INTRODUCTION

Genus *Jatropha* is a morphological diverse genus belonging to family Euphorbiaceae native of central America and Mexico, but is widely distributed in cultivated or wild stands in Latin Africa, America, India and South East Asia (Dehgan and Webster (1979*). Jatropha curcas* Seed kernel contains 33-40 % oil especially used for medicinal values and biodiesel production. The oil is known as curcas oil having high value and can be used directly in diesel engines added to fuel as an extender. Pure *Jatropha curcas* diesel is non-toxic in nature. The oil has greater lubricity and reduces engine wear. The oil of *Jatropha curcas* is widely used as an antiseptic for cough, skin diseases and as pain reliever, produces glycerin as by-product, which is in great demand for medicine, cosmetic and food product industries (Datta *et al*. 2007, Staubmann 1999). The leaves are used in different forms in West Africa in ethno-medical practice to cure fever, mouth infections, jaundice and guinea worm sores (Irvine, 1961; Oliver-Bever, 1986). In addition to bio-diesel, it also yields byproduct like glycerine and seed cakes after transesterification process. Glycerine can be used in soap preparation and cosmetics while seed cake can be used as bio-fertilizer, fuel briquettes, and paper making. *Jatropha gossypifolia* is used for the treatment of various types of disorders in the ayurvedic and folklore system of medicine in Bangladesh. The leaves of the plant are traditionally being applied to boils, carbuncles, eczema, itches, and veneral diseases in Latin America and the Caribbean Parvathi *et.al* (2012) and also used as febrifuge, Seeds are emetic, purgative and used for cancer and body pain. The leaves and seeds of *J. gossypifolia* are considered as a purgative and are widely used to treat obstinate constipation. Roots are used to treat leprosy Dhale and Birari (2010) and stem latex possess coagulant activity. Oduola *et.al* (2005).

Jatropha plant which has been identified as a potential biodiesel crop, National and State Governments have drawn ambitious programmes for its large scale cultivation (Kou and Chou, 2007., Mandpe *et al.*, 2005 and Openshaw, 2000). Most of the species of the *Jatropha* can be cultivated in the tropical and subtropical regions of the country. It has low requirements to soil quality and can grow under low rainfall conditions (Heller, 1996). In most of the vegetatively propagated plant species, there may be need for pre-planting practices to ensure rapid development of the crop.

The cultivation of *Jatropha* species is also reported to control erosion (Gubitz *et al*., 1999). Among various bio-diesel plants *Jatropha curcas* L. in particular have become popular for the cultivation in the region of Maharashtra for afforestation of

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wasteland under both irrigated as well as rain fed conditions (Gaikwad and Mukadam, 2009).

Therefore present study was planned with the aim to improve rooting in cuttings through vegetative propagation of *Jatropha curcas* L. and *Jatropha. gossypifolia* L. by stem cuttings. Keeping in view the medicinal and bio-diesel importance of *Jatropha* species the present study was designed to increase number of plants through vegetative propagation.

MATERIALS AND METHODS

Selection and plantation of cuttings

In the present study healthy cuttings from five years old mature thick terminal branches of *Jatropha curcas* and three years of old *Jatropha gossypifolia* mature branches were selected from Botanical Research garden at Department of Botany, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (M.S).

Stem cutting from the basal portion of branches with short internode of *Jatropha curcas* and *Jatropha gossypifolia* different length and different thick stem cuttings were selected The cuttings were planted in right season i.e. February to March and September to October. Polybags having size of 22.5 x 12.5 cm were used for planting (Heller, 1992). Polybags were filled with mixed soil and well decomposed farm yard manure in equal proportion in ratio (1:1:1). The drainage holes were provided at the bottom of the polybags. The cutting were washed in tap water and tied in bundles of 10 each. Cutting bundles were treated with 0.3 % Benomyl for 15 minutes. The experiment was laid out in randomized block design with replications. The cuttings were planted in polybags. After 90 days, planting observations were recorded.

Collection, isolation and identification of fungi

Infected stem cuttings were collected from planted polybags and fungi were isolated by using Potato Dextrose Agar (PDA) medium at plant pathology laboratory, Department of Botany, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (M.S). The fungi occurring on stem cuttings in the plates were identified preliminary on the basis of sporulation characters like sexual or asexual spores with the help of stereoscopic binocular microscope. The identification and further confirmation of fungi was made by preparing slides of the fungal growth and observing them under compound microscope. The identification was made with the help of manuals (Mukadam et al., 2006), (Alexopoulous, 1996) and (Barnett, 1970) Pure cultures of these fungi were prepared and maintained on potato dextrose agar (PDA) slants.

RESULTS AND DISCUSSION

Table 1 Effect of types of stem cuttings on rooting in *Jatropha curcas* and *Jatropha gossypifolia*

Types of cuttings	Species of *Jatropha*			
	Jatropha curcas		*Jatropha gossypifolia*	
	Percent of rooting (Mean)	Number of leaves per cuttings (Mean)	Percent of rooting (Mean)	Number of leaves per cuttings (Mean)
Softwood cuttings	40	3.8	--	--
Semi hard wood cuttings	80	4.8	40	9.6
Hardwood cuttings	80	8.6	50	11.2
S.D	39.33	3.53	23.45	5.39
S.E±	16.06	1.44	9.57	2.20
C.D(P=0.05)	41.26	3.70	24.61	5.66

Table 2 Effect of different length of stem cuttings on rooting in *Jatropha curcas* and *Jatropha gossypifolia*

Length of cuttings (cm)	Species of *Jatropha*			
	Jatropha curcas		*Jatropha gossypifolia*	
	Percent of rooting (Mean)	Number of leaves per cuttings (Mean)	Percent of rooting (Mean)	Number of leaves per cuttings (Mean)
5	--	--	--	--
10	20	2.8	--	--
20	20	2.8	20	7.6
30	20	12.4	20	12.4
40	30	14.2	20	10.6
S.D	12.25	6.30	10.95	5.79
S.E±	5.00	2.57	4.47	2.37
C.D(P=0.05)	12.85	6.61	11.49	6.08

Table 3 Incidence of fungi on infected cuttings of *Jatropha species*

Fungi	*Jatropha species.*	
	% infection on *J. curcas* cuttings	% infection on *J. gossypifolia* cuttings
Alternaria alternata	50	20
Aspergillus niger	50	80
Aspergillus fumigatus	30	30
Aspergillus flavus	50	50
Fusarium moniliforme	10	--
Fusarium oxysporum	20	50
Mucur Spp.	50	30
Penicillium spp.	--	10
Rhizopus stolonifer	40	30
Trichoderma viride	--	20

Effect of types of stem cuttings on rooting in Jatropha curcas and Jatropha gossypifolia

It is clear from results summarized in table 1 that the cutting from lower portion of stems i.e. hardwood cuttings showed maximum success with 80% rooting and 8.6 leaves per cuttings in *J. curcas,* as compared to semi hard and soft wood cuttings. Similarly in *J. gossypifolia* hardwood cuttings proved to be superior over semi hardwood and softwood cuttings with maximum rooting percent and highest number of leaves per cuttings. It is interesting to note that softwood cutting of *J. curcas* showed minimum percent rooting and less number of leaves per cutting while *J. gossypifolia* showed no response for rooting and leaves to softwood cuttings.

Effect of different length of stem cuttings on rooting in Jatropha curcas and Jatropha gossypifolia

It is clear from result mentioned in table 2 that the cuttings of *J. curcas and J. gossypifolia* with different lengths showed significant changes in rooting percent and number of leaves per cutting. *J. curcas* with vegetative cutting of length 40 cm showed maximum percent rooting and leaves per cuttings while cuttings with 10cm length showed poor rooting and leaves

response. Similarly in *J. gossypifolia* cuttings of length 20 and 30cm proved significantly similar to percent rooting and number of leaves per cuttings were maximum in case of 40 cm. It is interesting to note that there was no rooting and leaves for cutting of 5 cm length in both the *Jatropha* species. Use of vegetative stem cuttings for the propagation of plants have been found very effective method in number of plants like *Ficus carica*, *Nerium indicum* Nambison *et.al* (1977), *Casuarina junghuhniana* Ravichandran *et.al* (1994), *Punica granatum* Chapman and Hussey (1980), *Casuarina equisetifolia ,* puri (1990), *Jatropha curcas* Gaikwad (2011), *Jatropha curcas,* Thitithanavanich (1985). (Kobilke, 1989, Heller, 1992, Kaushik and Kumar, 2005,Thitithanavanich, 1985,), Kathiravan *et al.* (2009) reported that longer cuttings were more successful in vegetative propagation than shorter cuttings. According to Aminul-Islam *et al.* (2010) and Adekola *et al.* (2012) Sahoo *et.al* (2014) longer cuttings of *J. curcas* were found to perform better in terms of all the rooting due to fact that longer cuttings probably have higher food reserves. Similar type of experiments were carried out in the present studies to propagate *Jatropha* plants from stem cuttings.

Incidence of fungi on infected cuttings of Jatropha species

It is clear from table 3 that the cutting of *J. curcas* showed 08 different types of fungi namely *Alternaria alternata, Aspergillus niger A. fumigatus A. flavus, Fusarium moniliforme, F. oxysporum, Mucur* spp, *Rhizopus stolonifer* while these cuttings showed no incidence of *Penicillium* spp, *and T. viride. Similarly* the cutting of *J. gossypifolia* showed 09 different types of fungi namely *Alternaria alternata, Aspergillus niger A. fumigatus A. flavus, A. flavus, F. oxysporum, Mucur* spp, *Penicillium* spp, *Rhizopus stolonifer and T. viride.* while these cuttings showed no incidence of *Fusarium moniliforme.* Korpenwar and Gaikwad (2018) observed different fungi from *Chlorophytum borivilianum* .Roy (2003) studied that the frequent occurrence of *Aspergillus, Fusarium* and *Penicillium* species on different plant parts. Santhosh *et al.(* 2011) observed 41 endophytic fungi from 195 samples of healthy leaves and stem of a red listed endangered medicinal plant *Coscinium fenestratum.*

CONCLUSIONS

Hardwood cuttings proved to be superior over semi hardwood and softwood cuttings with maximum rooting percent and highest number of leaves per cuttings. The cuttings of *J. curcas and J. gossypifolia* with different lengths showed significant changes in rooting percent and number of leaves per cutting. Therefore, hardwood cuttings and 40 cm length of stem cutting may be recommended for plantation programme.

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