



Seedling behaviour and growth status of endangered medicinal tree *Amoora Rohituka* Roxb. In Meerut, U.P. India

Yashwant Rai

Department of Botany Department D.N. College, Meerut, UP, India.

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ABSTRACT

A. rohituka is highly valued tree species for the humans, environment and forestry. The tree is distributed some parts of India but now it is endangered species in many areas in the country. This tree belongs to Meliaceae family. Twin, triple, four and five shoot seedling is one of the abnormalities of seedling which produce single embryo in a seed. This could be due to some developmental errors that occur in the seed. *A. rohituka* have only one embryo per seed and it produced into one seedling. I had recorded 35 % seeds of *A. rohituka* produced twin, triple, four and five shoot seedlings. In this research paper studies, Germination, seedlings behaviour and four months growth status were recorded in *A. rohituka*. These are study parameters, germination percentage, abnormal seedlings percentage, seedling behaviour and growth status at 120 days after germination period. I had recorded two shoot seedlings survival at only early stages (within 60 days) of development but triple, four, five shoot seedlings not survive of *A. rohituka*. It was observed first time growth status of abnormal seedlings in *A. rohituka*. This research paper utility in various fields such as forestry, agriculture, environment, genetics, and embryology.

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Introduction

Amoora rohituka is an endangered evergreen tree species belongs to the family Meliaceae. It is commonly known as Pithraj. It is big sized tree grows up to 35 feet in height. Fruits globular, smooth, yellow when ripe, seeds with scarlet. The plant parts such as stems, leaves, seeds, barks and roots are used in herbal medicine.

The seeds are credited with anthelmintic, laxative and refrigent activities. Also, they are used for curing ulcers and muscular pains. The bark is strong astringent and is used in diseases of the liver, enlarged spleen, tumours and abdominal complaints. The plant produce amooranin. It useful in breast cancer, colon cancer and leukaemia. Perhaps, this could be the first reported abnormal seedling growth status in *A. rohituka*. Morphological abnormalities in seedling as polyembryony, double embryo, twin and triple seedlings, albino and chlorophyll mutant seedlings are widely reported in country. Such abnormalities are due to several factors such as developmental error during development of ovary, during fertilization, genetic factors or mutation (Gunaga *et al.*, 2008). Twin seedling is one of the abnormalities of seed which produce more than one seedling from single embryo in a seed. This could be due to some developmental errors that occur in the seed. These twin seedlings are generally discarded from packing stock before transportation of seedling to the planting site. The occurrence of Polyembryony reported that in number of forest economically important species like *Pongamia pinnata* (Vasantha Reddy *et al.*, 2006), reporting of such abnormality like twin seedlings were recorded in *Terminalia bellerica* in of the commercially important medicinal tree species (Gogate *et al.*, 2012.). The utility of twin seedlings is occurrence of two seedlings from a single seed. Abnormal seedlings seedlings are most important for future genetic improvement, plant breeding improvement,

forestry conservation programmes, seller of plants and environment conservation programmes

Synonym: *aglaia polystachya*, *aphanamixis polystachya*, *andersonia rohituka*, *ricinocarpodendron polystachyum*

Vernacular name

Gujarati → Ragat ,Rohido

Marathi → Raktharohida

Bengali → Tiktaraj

Kannada → Mullumuttage

Tamil → Malampuluvan,

Hindi - Rohera

Materials and methods:

The present study was undertaken at the B-16 Jawala Nagar Ambedker chock district Meerut Uttar Pradesh. *A. rohituka* seeds were collected during the end of April 2013, from Acharya Jadish Chandra Bose Botanical Garden Kolkata, India. The seeds were sown in the pots during second week of May 2013. The emergence rises from seeds after 6 days from date of sowing, completed germination within 21 from date of sowing. The total germination percentage of seeds 95 %, (35% abnormal, seedlings and 60 % normal seedlings) were observed within 21 days from date of sowing. Respectively to observe the seedling behaviour and growth status of twin (abnormal) seedlings at 120 (June to September 2013) days after germination period.

Results and Discussion

Seeds of *Amoora rohituka* have only one embryo per seed and it produce into single seedling (normal seedling) (Fig 5.). It was recorded total germination percentage of *A. rohituka* 95% within 21 days from date of sowing table 1. I had recorded 35 % abnormal seedling such as twin (two shoot) seedlings (Fig.3, 4,5), three shoot (fig. 6,), four shoot (fig.7, 8) and five shoot (Fig. 8, 9) seedlings but three shoot, four shoot, five shoot

seedlings were not survival or degenerate within 30 days after germination period clear (fig. 6,7,8,9).



Fig 1. Mature seeds bearing on *A.rohituca* tree



Fig 2. Seeds collected by Yashwant Rai



Fig 3. Early growth status of twin seedlings



Fig 4. Close view of twin seedlings

It was observed two shoot seedlings growth (shoot height) status at 30 and 60 days slightly difference compared to normal seedlings (table 2, 3 fig. 5). It was observed second shoot of twin seedlings reduce height and poor development at 90 and 120 days compared to normal seedlings results showed (table 4, 5, fig. 10, 12). But second shoot could be degenerate after 60 days the main shoot enhanced growth status compared to normal seedling at 90 and 120 days after germination period. (table 4, 5 fig. 13, 14). Girth size Mean of twin seedlings were recorded 1st shoot 2.3 cm. and second shoot 0.98 cm. but 1st shoot girth size 3.6 after degenerate second shoot and normal seedlings girth size Mean 3.4 cm. at 120 days after germination period

which was higher compared to the normal seedlings respectively clear results table 5, Fig. 14.



Fig 5. Twin(two shoot) and normal (single shoot) seedling



Fig 6. View of three shoot seedling in *A. rohituca*



Fig 7. View of four shoot seedling



Fig 8. View of abnormal seedlings

The mean height and girth size of normal seedlings recorded 42.46 cm and 3.4 cm, and twin seedling main shoot

42.62 cm and girth size 3.6 cm after degenerate second shoot at 120 days which was higher growth of twin seedlings (degenerate second shoot) compared to normal seedlings. Two shoot seedling very important role in increase number of plants clear (Fig. 11), and separate seedling clear (fig.15).



Fig. 9. Close view of five shoot seedling and view of degenerate shoots



Fig. 10. Growth status of normal and twin seedlings



Fig. 11. Close view of root and shoot development of twin seedling

All results clear in table and figures. According to some research workers on such twin seedlings had recommended to keep leading shoot for higher vigour and remaining shoots can be culled out at earliest possible to use these seedlings for field planting. Reported to (Manickam and Kalidass 2008) The twin seedling exhibited stunted growth and poor development when compared to normal seedlings in *Filicium decipiens*. Reporting of such variations is most important for future genetic improvement and conservation plants. Such observations on occurrence of either twin or polyembryony at seedling stage have already been reported in several tropical tree species such

as *Dalbergiasissoo* (Kumar *et al.*, 1977), *Bombax ceiba* (Venkatesh and Emmanuel, 1978), *Putranjiva roxburghii* (Thapliyal, 2004), *Nothapodytes nimmoniana* (Hombe Gowda *et al.*, 2004), However, some research workers on such twin seedlings had recommended to keep leading shoot for higher vigour and remaining shoots can be culled out at earliest possible to use these seedlings for field planting.



Fig. 12. Stunted growth of twin seedling after 60 days



Fig. 13. Stunted growth of twin seedling after 60 days



Fig. 14. Closed view Degenerate second shoot and well developed first shoot of twin seedling

(Gunaga and Vasudeva 2008) have reviewed such abnormal seedlings recorded in several tropical tree species like *Acacia farnesiana*, *Robinia pseudocasia*, *Terminalia arjuna*, *Tectona grandis*, *Santalum album*, *Shorea robusta*, *Dalbergia sissoo*, *Bombax ceiba*, *Putranjiva roxburghii*, *Nathopodytes nimmoniana*, *Saraca asoca*, *Garcinia indica* and *Mammeasuriga* across the country. Wanage *et al.*, (2010) observed that total germination of 78 per cent was recorded in *Saraca asoca* out of these seedlings, 5.13 per cent of seedlings were polyembryony. Rane *et al.*, (2012), reported that the total germination percentage of seed lot was 86. It was observed that 0.33 per cent of twin seedling in *Gloriosa superba* L.

Total Germination And Abnormal Seedlings Percentage

Table 1

		May						
Days		3	6	9	12	15	18	21
Germination (%)	Total germination %	=	=	40	60	80	90	95
	Abnormal seedlings			10	20	25	30	35

Table 2. Growth status abnormal and normal seedlings at 30 days after germination period

		Shoot Length (cm.) Mean \pm SD
Normal Seedling		15.92 \pm 0.13
Twin Seedling	Ist Shoot	15.08 \pm 0.13
	IInd Shoot	14.3 \pm 0.35
Triple seedlings	Three shoot	Not survival
Four seedlings	Four shoot	Not survival
Five seedlings	Five shoot	Not survival

Table 3. Twin and normal seedlings growth status at 60 days after germination period

		Shoot Length (cm.) Mean \pm SD
Normal Seedling		22.7 \pm 0.45
Twin Seedling	Ist Shoot	19.12 \pm 0.29
	IInd Shoot	16.0 \pm 0.15

Table 4. Twin and normal seedlings growth status at 90 days after germination period

		Shoot Length (cm.) Mean \pm SD	Ist Shoot Length (cm.) (Degenerate IInd Shoot after 60 days, Mean \pm SD)
Normal Seedling		30.75 \pm 0.23	-
Twin Seedling	Ist Shoot	23.56 \pm 0.35	30.2 \pm 0.18
	IInd Shoot	17.38 \pm 0.43	Degenerate

Table 5. Twin and normal seedlings growth status at 120 days after germination period

		Shoot Length (cm.) Mean \pm SD	Girth Size (cm.) Mean \pm SD	Ist Shoot Length (cm.) (Degenerate IInd Shoot) Mean \pm SD	Ist Shoot Girth Size (cm.) (Degenerate IInd Shoot) Mean \pm SD
Normal Seedling		42.46 \pm 0.65	3.4 \pm 0.29	-	-
Twin Seedling	Ist Shoot	26.22 \pm 0.19	2.3 \pm 0.25	42.62 \pm 0.52	3.6 \pm 0.27
	IInd Shoot	19.12 \pm 0.19	0.98 \pm 0.08	Degenerate	

The polyembryony noticed during germination studies of *Atylosia scarabaeoides* under laboratory condition. (Kalidass and Mohan 2012.) This research very important in various fields such as forestry, environment, genetics, and embryology. The occurrence of polyembryony has been reported in number of forest economically important species like *Filicium decipiens* (Manickam and Kalidass 2008).



Fig. 15. Seprate 1st and 2nd shoot poorly dev. of 2nd root and well development of 1st root system

Conclusion

The twin seedlings exhibited stunted growth and poorly developed root system when compared to normal seedlings and it was observed that the other second shoot after some time

perished First shoot enhanced growth of twin seedlings compared to normal seedlings. Early stage growth status of twin seedlings, same normal seedlings. Abnormal seedlings seedlings are most important for future genetic improvement, plant breeding agriculture, forestry conservation programmes, seller of plants and environment conservation programmes

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