Expert System for Patchouli Species

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Abstract

Patchouli (*Pogostemon cablin*) is normally propagated vegetative through stem cuttings. Number of factors such as climate, type of cuttings, rooting media, etc. governs the growth and survival of the saplings. Striking effects of different cutting lengths and cutting diameters on growth and survival were observed under Mist Chamber and Agronet shade conditions. The present study was conducted to come out with recommendations regarding appropriate ranges of cutting lengths and cutting diameters for optimum growth and survival of Patchouli in nursery stage. Through the efficient statistical computer algorithm RCDA by varying the different diameters and lengths, results are computed, tested and verified with the maximum survival and growth. The RCDA algorithm helped in processing of datasets into performance groups to better understand the effects of different diameters, lengths of cuttings on survival and growth of patchouli plant.

Keywords: Precision Agriculture, Optimality, Irrigation, CV, RSquare, Efficiency etc.

I Introduction

Patchouli (*Pogostemon cablin* (Blanco) Benth. syn *P. patchouli* Pellet var. *suavis* Hook.f.) belonging to the family Lamiaceae is an erect, well-branched, pubescent small aromatic bushy herb attaining a height of about 0.5-1.2 m remaining in the field for about 3-4 years giving 3 or even more harvests of leaves annually. Its fragrant leaves containing very sweet smelling oil is of immense commercial importance. Patchouli is native to Philippine Islands and grown in a number of South East Asian Countries as commercial crop. Attributed with a number of cosmetic and medicinal properties, the plant is also used as insect repellant and as main ingredient in modern Aromatherapy. In view of the versatile commercial potential of Patchouli in Indian northeast region, there is need to optimize its production by extending the areas under cultivation as well as to increase the productivity by extensive research efforts. Out of the several ways to increase the productivity, standardization of site-specific nursery techniques is also considered most important. Keeping the fact in view, experimental trials on optimization of cutting size (in respect of length and diameter) of Patchouli were laid out to study the effect on its growth and survival in nursery stage.

With a view to promote the large-scale cultivation of Patchouli, attempt has been made by various workers, to develop agropractices and agroforestry models under site specific conditions [2,3]. Cultivation trails had been undertaken by various workers under varying condition [4,5]. Possibility of growing this plant as an intercrop with some species viz., coconut, papaya, oilplam, rubber, Pinus sp etc. has also been explored [6]. According to [9] normally stem cuttings are used as propagating material. Three nodded cuttings had maximum rootability than two node cuttings in all types of cuttings. In the present study, appropriate ranges of cutting lengths and cutting diameters for optimum growth and survival of Patchouli in nursery stage have been suggested.

II Materials and Methods

Modules (Computer Programs) have been developed for the expert system. The technology is the Visual C# with .NET have been used. This platform and technology[10-12] is suitable for software development. It utilizes various key features of object oriented technologies such as its ability to programme in an event driven operating system with great ease, write code for events automatically, optimize code capability for native platform, etc. The basic reason behind selection of this technology was its superior abilities for code reusability, inheritability, encapsulation, portability and modular development. The concept of various scripting languages have been used and this expert system is very easy to use and beneficial for everyone who is directly or indirectly related to this field.

The material of the patchouli species has been taken from the real experiment data under mist chamber condition and under Agronet shade condition.

Standard methods for vegetative propagation were adopted under mist chamber condition and under Agronet shade condition. Experiment was laid out in randomized block design (RBD). Each treatment was replicated four times and planted in root trainers under Mist Chamber and Agronet shade conditions (75:25). The mist was run for 10 seconds after every 30 minutes. The root trainers bearing the cuttings were taken out after 20 days from the Mist Chamber to shade condition and data were

recorded on two parameters i.e. survival percentage and height increment. All the computations have been done with the help of Expert System. The advanced computer algorithms with statistical techniques with innovative methologies have been utilized through Expert System. The best decision is also suggested by the expert system in order to increase the survival percentage of patchouli by keeping all the parameters into consideration.

III Experimental Analysis

The real data of the experiment have been used and through the expert system the result have been analyzed and interpreted. The home page of the expert system is as shown in fig. 1.

Fig. 1 Expert System for Patchouli Species

Rigorous experimentation through the algorithms embedded by varying the diameter, length and height with different sets of treatments with various conditions and situations and after implementation of statistical significant testing(Johnson andWichern,1979) and verified with the all quality measures with the survival (%) has been computed as shown in Tables.

Representations

Cutting diameters - D1 - 2mm, D2 – 4mm, D3 – 6mm
Cutting lengths-L1 – 5cm, L2 – 7.5 cm, L3 – 10cm, L4 – 12.5 cm
The two conditions : Agronet Shade Conditions (T1), Mist Chamber Conditions (T2), Survival-WL (%) Survival With Leaves, Survival-WoL (%) Survival Without Leaves

Condition		Different Diameters	No. of plants survived	Survival %
Agronet Shade (T1)	T1	D1	54	75.000
	T1	D2	48	66.667
	T1	D3	54	75.000
Mist Chamber (T2)	T2	D1	66	91.667
	T2	D2	60	83.333
	T2	D3	54	75.000

Table 1 : Effect of different diameters of leafy cuttings on Survival

Condition		Different Diameters	No. of Plants Survived	Survival %
Agronet Shade (T1)	T1	D1	56	77.778
	T1	D2	53	73.611
	T1	D3	66	91.667
Mist Chamber (T2)	T2	D1	56	77.778
	T2	D2	60	83.333
	T2	D3	53	73.611

Table 2: Effect of different diameters of leafless cuttings on Survival

Result through Expert System

Performance Group 1

Treatment Cluster	Treatment	Survival-WL (%)
T2	D1	91.667
T2	D2	83.333

Performance Group 2

Treatment Cluster	Treatment	Survival-WL (%)
T1	D1	75
T1	D3	75
T1	D3	75

Performance Group 2

Treatment Cluster	Treatment	Survival-WL (%)
T1	D2	66.667

Table Result 1: Effect of different diameters of leafy cuttings on Survival

Performance Group 1

Treatment Cluster	Treatment	Survival WoL (%)
T1	D3	91.667

Performance Group 2

Treatment Cluster	Treatment	Survival WoL (%)
T1	D1	77.778
T2	D1	77.778
T2	D2	83.333

Performance Group 3

Treatment Cluster	Treatment	Survival WoL (%)
T1	D1	73.611
T2	D1	73.611

Table Result 2: Effect of different diameters of leafless cuttings on Survival

Conditions		Different Lengths	No. Of Plants Survived	Survival %
Agronet Shade (T1)	T1	L1	61	84.722
	T1	L2	66	91.667
	T1	L3	55	76.389
	T1	L4	58	80.556
Mist Chamber (T2)	T2	L1	72	100.000
	T2	L2	72	100.000
	T2	L3	67	93.056
	T2	L4	61	84.722

Table 3: Effect of different lengths of leafy cuttings on Survival

Condition		Different Lengths	No. of plants Survived	Survival %
Agronet Shade (T1)	T1	L1	44	61.111
	T1	L2	60	83.333
	T1	L3	48	66.667
	T1	L4	48	66.667
Mist Chamber (T2)	T2	L1	54	75.000
	T2	L2	53	73.611
	T2	L3	60	83.333
	T2	L4	66	91.667

Table 4: Effect of different lengths of leafless cuttings on Survival

Results through RCDA Algorithm

Performance Group 1

Treatment Cluster	Treatment	Survival-WL (%)
T1	L2	91.667
T2	L1	100
T2	L2	100
T2	L3	93.056

Performance Group 2

Treatment Cluster	Treatment	Survival-WL (%)
T1	L1	84.722
T2	L4	84.722

Performance Group 3

Treatment Cluster	Treatment	Survival-WL (%)
T1	L3	76.389
T1	L4	80.556

Table 3 Result: Effect of different lengths of leafy cuttings on Survival

Performance Group 1

Treatment Cluster	Treatment	Survival-WoL (%)
T1	L2	83.333
T2	L3	83.333
T2	L4	91.667

Performance Group 2

Treatment Cluster	Treatment	Survival-WoL (%)
T2	L1	75
T2	L2	73.611

Performance Group 3

Treatment Cluster	Treatment	Survival-WoL (%)
T1	L1	61.111
T1	L3	66.667
T1	L4	66.667

Table 4Result: Effect of different lengths of leafless cuttings on Survival

Interpretation

The data on survival percentage and height increment of Patchouli cuttings of different diameter and length under Mist Chamber conditions and Agronet shade conditions have been taken in the above data set.
Effect of different cutting diameters on survival percent (Table 1 and 2), recorded maximum survival in leafy cuttings of 2 mm diameter (100%) followed by 4 mm diameter (91.66) under Mist Chamber conditions whereas leafless cuttings of 4 mm diameter shown survival of 83.33 per cent as compared to other cuttings of different diameters. Under Agronet shade conditions survival of leafy cuttings of 2 mm and 4 mm diameter (75% each) were obtained whereas leafless cuttings shown maximum survival of 91.66 per cent in 6 mm diameter. Effect of different cutting diameters on height increment shown in Table 3 and 4. Under Mist Chamber conditions, leafy cuttings of 2 mm diameter shown the increment of 13.3 cm in height followed by increment of 6.36 cm and 5.67 cm from leafy cuttings of 6 mm and 4 mm diameter respectively. Leafless cuttings of 4 mm diameter shown increment of 3.04 cm whereas 2 mm and 6 mm leafless cuttings shown increment of – 0.75 cm and – 1.47 cm respectively. Under Agronet shade conditions only leafy cuttings of 2 mm diameter shown positive increment of 2.62 cm followed by 4 mm and 6 mm diameter cuttings shown – 0.02 cm and – 0.92 cm respectively. Whereas, leafless cuttings of 6 mm diameter put 0.28 cm increment but others showed negative increment.

Conclusion

The growing interest in fragrance has led to patchouli's widespread cultivation throughout tropical Asia. The advantage in growing this plant for the Fragrance industry is that the potential is enormous and almost unlimited, the returns are satisfactory, and more interestingly, it can be grown as a second crop, in partial shade, under Coconut, or Areca Nut, with very little additional costs. Expert System gives the maximum survival percent by keeping all the other parameters to the optimum.

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