

EFFECT OF SOWING DATES AND RHIZOME TREATMENTS ON PERCENT RHIZOME GERMINATION AND SAPONIN CONTENT OF *Chlorophytum borivilianum*

Saket Shende, R.W. Ingle, V.V. Deshmukh and M.S. Joshi

Department of Plant Pathology, Dr. PDKV, Akola

Abstract: *Chlorophytum borivilianum* a herbaceous plant belong to liliaceae family and has medicinal value. Therefore, an experiment was conducted to see the effect of different sowing dates and treatments on per cent germination and saponin content of safed musali. The results indicated that D3 (30th June 2011) showed highest germination per cent at 7th, 14th, and 28th, DAS. Similar results were obtained in interaction. Similarly treatment T3 exhibited highest germination per cent. Regarding saponin content D3 showed highest saponin content 6.59% with 0.26g/plot yield. The highest saponin content was observed in T3 6.64% with 29.88g/plot yield.

Keywords: sowing dates, germination, saponin content, *trichoderma viride*, *Pseudomonas fluorescens* and *chlorophytum borivilianum*.

Introduction

Chlorophytum borivilianum is herbaceous belongs to the family Liliaceae. It is distributed mainly in the Southern Rajasthan, North Gujarat and Western Madhya Pradesh and some part of Vidrabha region. Now this crop has been brought under commercial cultivation in Gujarat, Rajasthan, Maharashtra, Karnataka, Madhya Pradesh, and Tamilnadu etc. (Bordia *et al.* 1990).

Now a days commercial cultivation of medicinal aromatic plants has increased and so as their pathological problems. Because of monocropping the disease intensity and incidence may increase in recent future. In Vidarbha region the farmers are adopting the practice of early sowing of Safed Musli for early production and to get the high market price. The most of diseases were found in July – August coupled with rainfall and high humidity. Root rot of Safed Musli being a soil borne as well as rhizome borne is difficult to manage constraint in cultivation while other foliar diseases can be managed by spraying of judicious fungicides. The root rot of Safed musli which is effect the rhizomes and saponin content.

*Received July 5, 2014 * Published August 2, 2014 * www.ijset.net*

Bordia *et al.* (1990) reported major constituents of Safed Musli as: Carbohydrate (42%), Protein (8.9%), Root fiber (3-4%) and Saponin (2-17%). Saponins are the potent medicinal compounds in the roots of Safed Musli and have been the object of study for many years because of their occurrence in quite high concentration in roots. Distributions of saponin are not restricted to storage organs and are also present in various plant parts (Birk, 1963). The wide range of saponins are being used in soft drinks, beers, confectionaries, shampoo, soaps and fire extinguishers based on their ability to form stable foams in aqueous solution and permanent suspensions with oil or powder.

Material and Methods

Field experiment was conducted during 2011-12 at Nagarjun Medicinal and Aromatic plant Garden, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola in Split Plot Design with three replications consisting 2 factors major one as sowing date and minor as seed treatment.

Crop : Safed Musli
 Season : *Kharif*
 Plant to Plant distance: 10 cm
 Row to Row distance : 30 cm
 Plot size : 2.4 x 2.1 m²
 Replication : Three
 Design : Split Plot Design
 Treatments : Four (4)

Treatment details

Main factor

Sr. no.	Date of sowing	
1	D ₁	10 th June 2011
2	D ₂	20 th June 2011
3	D ₃	30 th June 2011

Sub factor

Sr. No.	Treatment No.	Treatment Details
1	T ₁	Rhizome treatment with <i>Trichoderma viride</i> + <i>Pseudomonas fluorescens</i>

2	T ₂	Rhizome treatment with Carbendazim + Mancozeb
3	T ₃	Rhizome treatment with T1 + T2
4	T ₄	Control

Estimation of saponin in Safed Musli

Saponin content was estimated by using the procedure given by Birk *et al.*, 1956

Procedure

- One hundred grams of dried Safed Musli powder was suspended in 500 ml of 85 per cent ethanol and kept overnight.
- Supernatant was collected in one liter round bottom flask. Residue was re-extracted in 85 per cent ethanol and refluxed for half an hour. This procedure was repeated thrice.
- All the extracts were then pooled and ethanol removed by distillation.
- The soft extract that remained was extracted using 500 ml petroleum ether was refluxed for 30 minutes, cooled and the solvent poured off.
- The remaining soft extract was refluxed with 500 ml of ethylacetate, followed by 500 ml of chloroform for 30 minutes; successively the organic solvent were removed from the separating funnel.
- The soft extract was dissolved in 500 ml of methanol, filtered and concentrated to 100 ml. This hot extract is added drop by drop to 500 ml of acetone. A white precipitate thus formed is collected in a small beaker, dried in an oven at 60°C and finally collected as light brown powder, and finally take the weight of the light brown powder. In this way done the analysis of saponin content of tubers and noted the result.

Results and Discussion

Effect of sowing dates on germination percent

Table 2. Effect of sowing dates on germination per cent

Treatment details	Germination percent DAS			
	7DAS	14DAS	21DAS	28DAS
D ₁	8.38 (16.29)**	19.86 (26.04)**	36.98 (37.32)**	82.35 (65.39)**
D ₂	12.74 (20.42)	63.19 (52.71)	80.63 (64.03)	88.81 (70.58)
D ₃	63.07 (52.77)	71.54 (57.90)	78.93 (63.02)	86.39 (68.55)

`F' Test	Sig.	Sig.	Sig.	Sig.
SE(m)±	1.15	0.52	1.44	0.68
CD at 5%	4.51	2.06	5.64	2.68

Figure in parenthesis ** indicate arc sin values

The highest germination percent was recorded in D₃ (30th June 2011), 63.07% and 71.54% at 7th ad 14th DAS respectively.

Where as highest germination percent was observed in D₂ (20th June 2011), 80.63% followed by D₃ (30th June 2011), 78.93% and D₁ (10th June 2011), 36.98% at 21 DAS. At 28 DAS the highest germination percent was recorded observed in D₂ (20th June 2011), 88.81% followed by D₃ (30th June 2011), 86.39% and D₁ (10th June 2011), 82.35%.

Gradual increase in the germination percent was observed. The highest germination percent observed in 2nd date of sowing i.e. 20th June and lowest one was observed in D₁ i.e. 10th June. This may the unique character of Safed Musli that its tubers sprout naturally after first shower of monsoon. So late sowing of Safed Musli should be preferred. Similar results were reported by Tekade *et al.* (2009) and Naidu (2011)

Effect of treatment on germination percent

The germination percent of tubers were high in T₃ treatment i.e. combination of bio control and chemical fungicides compared to control 7th DAS (29.24%), 14DAS (49.06%), 21DAS (62.85%) and 28 DAS (81.00%).but D₂ and D₃ were at par each other.

Table 3. Effect of seed treatments on germination per cent

Treatment details	Germination percent DAS			
	7DAS	14DAS	21DAS	28DAS
T ₁	21.08 (25.90)**	47.14 (42.76)**	64.58 (54.09)**	86.03 (68.13)**
T ₂	28.93 (29.32)	51.10 (45.05)	63.21 (53.50)	87.09 (69.05)
T ₃	33.02 (33.54)	58.82 (50.29)	71.36 (58.49)	89.27 (70.98)
T ₄	29.24 (30.55)	49.06 (44.11)	62.88 (53.05)	81.00 (64.55)
`F' Test	Sig.	Sig.	Sig.	Sig.
SE(m)±	1.33	1.27	1.25	0.64
CD at 5%	3.95	3.78	3.71	1.90

Figure in parenthesis ** indicate arc sin values

At 7 DAS the highest germination percent observed in T₃ (*Trichoderma viride* + *Pseudomonas fluorescens* + Carbendazim + Mancozeb), 33.02% followed by T₂ (Carbendazim + Mancozeb), 28.93% and T₁ (*Trichoderma viride* + *Pseudomonas fluorescens*) 21.08%. Similar, results were recorded at 14 DAS.

Germination percent observed in T₃ (*Trichoderma viride* + *Pseudomonas fluorescens* + Carbendazim + Mancozeb) was highest i.e. 71.36% followed by T₁ (*Trichoderma viride* + *Pseudomonas fluorescens*), 64.58% and T₂ (Carbendazim + Mancozeb) 63.21% at 21 DAS.

At 28 DAS the highest germination percent was recorded in T₃ (*Trichoderma viride* + *Pseudomonas fluorescens* + Carbendazim + Mancozeb), 89.27% followed by T₂ (Carbendazim + Mancozeb), 87.09% and T₁ (*Trichoderma viride* + *Pseudomonas fluorescens*), 86.03%.

Highest germination may be because of combination of these two helps to enhances germination percent. Similar results found to Bunkar and Mathur (2001) who observed that bioagent *Trichoderma viride* was promising in increasing germination. Bhatia *et al.* (2005) found the increased germination in seed treated with fluorescent *Pseudomonas*. Gawande *et al.* (2010) found that 25% increase in seed germination with the treatment of thiram + carbendazim @ 0.2% each and Naidu (2011) also found similar results.

Effect of interaction of sowing date and seed treatment on germination percent

At 14 DAS and 21DAS results were non significant.

At 7 DAS the results were statistically significant the highest germination percent observed in D₃T₃ (30th June 2011+ *Trichoderma viride* + *Pseudomonas fluorescens* + Carbendazim + Mancozeb), 73.61%; followed by D₃T₂ (30th June 2011 + Carbendazim + Mancozeb), 71.52%; D₃T₁ (30th June 2011 + *Trichoderma viride* + *Pseudomonas fluorescens*), 43.05%; D₃T₄ (30th June 2011+ control), 64.11%; D₂T₄ (20th June 2011+ control) 16.20%; D₁T₃ (10th June 2011+*Trichoderma viride* + *Pseudomonas fluorescens* + Carbendazim + Mancozeb), 12.96%; D₂T₃ (20th June 2011+ *Trichoderma viride* + *Pseudomonas fluorescens* + Carbendazim + Mancozeb) 12.49%; D₂T₂ (20th June 2011+ Carbendazim + Mancozeb), 11.34%; D₂T₁ (20th June 2011 + *Trichoderma viride* + *Pseudomonas fluorescens*), 10.93%; D₁T₁ (10th June 2011+ *Trichoderma viride* + *Pseudomonas fluorescens*), 9.24%; D₁T₄ (10th June 2011+ control), 7.40%; D₁T₂ (10th June 2011+ Carbendazim + Mancozeb), 3.93%.

Table 4. Effect of interaction of sowing Date and seed treatment on germination percent

Treatment details	7 DAS			
	T ₁	T ₂	T ₃	T ₄
D ₁	9.24 (17.62)**	3.93 (11.23)**	12.96 (21.03)**	7.40 (15.29)**
D ₂	10.93 (19.09)	11.34 (18.97)	12.49 (20.47)	16.20 (23.15)
D ₃	43.05 (40.98)	71.52 (57.76)	73.61 (59.12)	64.11 (53.22)
F test	Sig.			
S E (M)+ ₋	2.28			
CD @ 5 %	6.84			

Treatment details	28 DAS			
	T ₁	T ₂	T ₃	T ₄
D ₁	84.02 (66.45)**	84.49 (66.83)**	87.27 (69.15)**	73.61 (59.15)**
D ₂	85.96 (67.99)	86.76 (68.66)	87.81 (69.56)	82.73 (65.44)
D ₃	86.11 (68.18)	87.03 (68.91)	90.74 (72.28)	81.67 (64.82)
F test	Sig.			
S E (M)+ ₋	1.92			
CD @ 5 %	3.29			

Figure in parenthesis ** indicate arc sin values.

At 28 DAS highest germination percent observed in D₃T₃ (30th June 2011 + *Trichoderma viride* + *Pseudomonas fluorescens* + Carbendazim + Mancozeb), 90.74%; followed by D₂T₃ (20th June 2011 + *Trichoderma viride* + *Pseudomonas fluorescens* + Carbendazim + Mancozeb), 87.81%; D₁T₃ (10th June 2011 + *Trichoderma viride* + *Pseudomonas fluorescens* + Carbendazim + Mancozeb), 87.21%; D₃T₂ (30th June 2011 + Carbendazim + Mancozeb), 87.03%; D₂T₂ (20th June 2011 + Carbendazim + Mancozeb) 86.76%; D₃T₁ (30th June 2011 + *Trichoderma viride* + *Pseudomonas fluorescens*), 86.11%; D₂T₁ (20th June 2011 + *Trichoderma viride* + *Pseudomonas fluorescens*), 85.96%; D₁T₂ (10th June 2011 +

Carbendazim + Mancozeb), 87.27%; D₁T₁ (10th June 2011 + *Trichoderma viride* + *Pseudomonas fluorescens*) 84.02%; over control D₂T₄ (20th June 2011 + control), 82.73%; D₃T₄ (30th June 2011 + control), 81.67% and D₁T₄ (10th June 2011 + control), 73.61%.

In the present finding, we had taken combination of sowing dates with the various treatments and found that 7DAS and 28 DAS the results were statistically significant and at 14 DAS and 21 DAS the results were not significant.

Highest germination percent found in combination of sowing date 3rd and treatment 3rd (30th June 2011 + *Trichoderma viride* + *Pseudomonas fluorescens* + Carbendazim + Mancozeb) this combination found superior. So the late sowing with seed treatment of bioagent and chemical fungicide will help to increase the germination per cent. Similar results were also found to Gawande *et al.* (2010) found that *Trichoderma viride* + *Pseudomonas fluorescens* and Thiram + Carbendazim found most superior so their combination is most effective.

Table 5. Effect of sowing dates on saponin content of Safed Musli

Treatment details	Per cent saponin content	Yield of Saponin content per plant (g)	Yield of Saponin content per net plot (g)
D ₁	5.76 (2.50)*	0.20	20.73
D ₂	6.24 (2.59)	0.24	27.45
D ₃	6.59 (2.66)	0.26	32.06
`F' Test	Sig.		
SE(m)±	0.04		
CD at 1%	0.12		

Figure in parenthesis * indicate Square root values.

The result presented in Table 9 a revealed that the high saponin content was observed in date D₃.(30th June 2011) 6.59%; followed by D₂.(20th June 2011) 6.24%, and D₁.(10th June 2011) 5.76%.

The high yield of saponin content per plant observed in date D₃.(30th June 2011) 0.26 g.; followed by D₂.(20th June 2011) 0.24 g. and D₁.(10th June 2011) 0.20 g.

The high yield of saponin content per plot observed in date D₃.(30th June 2011) 32.06 g.; followed by D₂.(20th June 2011) 27.45 g. and D₁.(10th June 2011) 20.73 g. In present

investigation we extracted the saponin content from dried samples of samples of Safed Musli and found significant result. The highest saponin content was found in 3rd date of sowing. Followed by 2nd date of sowing and lowest percent of saponin content found in 1st date of sowing. Similar results were found to Naidu (2011) he found 5-7% of saponin content from different samples of Safed Musli.

Table 6. Effect of different treatments on saponin content

Treatment details	Per cent saponin content	Per cent increase over control	Yield of Saponin content per plant (g)	Yield of Saponin content per net plot (g)	Per cent Increase over control
T ₁	6.03 (2.55)*	4.32	0.23	27.13	20.36
T ₂	6.32 (2.61)	9.34	0.25	25.91	16.72
T ₃	6.64 (2.67)	14.87	0.25	29.88	32.56
T ₄	5.78 (2.50)		0.20	22.54	
`F' Test	Sig.				
SE(m)±	0.02				
CD at 1%	0.06				

Figure in parenthesis * indicate Square root values.

The result presented in Table 9 b revealed that the high saponin content was observed in T₃ (*Trichoderma viride* + *Pseudomonas fluorescens* + Carbendazim + Mancozeb), 6.64%.; T₂ (Carbendazim + Mancozeb), 6.32%; T₁ (*Trichoderma viride* + *Pseudomonas fluorescens*), 6.03% as compared to T₄-control 5.78%.

The high yield of saponin content per plant observed in treatment T₃ (*Trichoderma viride* + *Pseudomonas fluorescens* + Carbendazim+ Mancozeb), 0.25 g;. T₂ (Carbendazim + Mancozeb) 0.25g;. Followed by T₁ (*Trichoderma viride* + *Pseudomonas fluorescens*) 0.23 g. as compared to T₄-control 0.20 g.

The high yield of saponin content per plot observed in treatment T₃ (*Trichoderma viride* + *Pseudomonas fluorescens* + Carbendazim + Mancozeb), 29.88 g; followed by T₁

(*Trichoderma viride* + *Pseudomonas fluorescens*), 27.13 g. T₂ (Carbendazim + Mancozeb), 25.91 g. as compared to T₄-control 22.54 g.

In this finding we take different samples of Safed Musli grouped on the basis of seed treatment at the time of sowing. We found that treatment T₃ gave best results; it gave highest amount of saponin content. It was followed by T₂, T₁ and least saponin content was found in T₄. Similar results also reported by Bordia *et al.* (1990) reported that saponin (2-17 %) is major constituents of Safed Musli. Naidu (2011) reported that the yield of saponin ranged between 5-7%

Literature Cited

- [1] Bhatia, S., R.C. Dubey and D.K. Maheswari. 2005. Enhancement of plant growth and suppression of collar rot of sunflower caused by *Sclerotium rolfsii* Sacc. through fluorescent *Pseudomonas*. Indian Phyto Path. 58(1): 17-24.
- [2] Birk, Y., B. Gestetner and I. Ishaaya. 1963. A thermostable hemolytic factor in soybeans. Nature. 197: 1089-1090.
- [3] Bordia P.C., P. Seth and M.M. Simlot. 1990. Safed Musli (*Chlorophytum borivillianum*) in the Arawali region and preliminary observations. Paper presented in the National Symposium on Conservation and Management of living Resources. University of Agricultural Sciences, G.K.V.K., Bangalore. 10-12 January. Abstract. 4.
- [4] Bunker, R.N. and Kusum Mathur. 2001. Integration of biocontrol agents and fungicides for suppression of dry root rot of *Capsicum frutescens*. J. Mycol. Pl. Pathol. 31(3):330-314.
- [5] Gawande, S.B., D.N. Padule, Y.K. Madhahare, B.C. Gamme and V.A. Chavan. 2010. Efficacy of bioagents on seed mycoflora, seed germination, seedling vigour index and field emergence in sunflower. PKV Res. J. vol. 34(1): 65-69.
- [6] Naidu, M.S.K. 2011. Management of follicular and soil borne diseases of Safed Musli M.Sc. (Agri.) Thesis (unpub.), Dr. PDKV, Akola.
- [7] Tekade, Aparna, Mina koche and B. T. Raut. 2009. Influence of weather factors on fungal disease of musli. J. Pl. Dis. Sci. 4(2): 173-175.