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Extent of adoption of integrated weed management practices by grape growers

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Abstract

The present study was undertaken in Chikkaballapura district of Karnataka state to find out the extent of adoption of integrated weed management practices by grape growers. Sixty small farmers and 60 big farmers cultivating grapes were interviewed using a pre-tested schedule. The results revealed that over two-third of both the small and big farmers were having low to medium level of adoption of integrated weed management practices. Age, education, experience in grape cultivation, knowledge regarding weed management practices, cosmopolitanism, economic orientation, innovativeness, risk orientation, mass media participation, extension participation and extension contact of grape growers had significant to highly significant association with their adoption level of integrated weed management practices.

Keywords: Adoption, integrated, weed, grape growers, chi square test

1. Introduction

Weeds are among the most persistent challenges in horticultural crop production. They compete with cultivated plants for water, nutrients, light, and space and left unchecked, can significantly reduce yields and crop quality. For decades, the default response was to reach for herbicides. But over-reliance on chemical controls has led to a growing crisis: herbicide-resistant weed populations are spreading rapidly, and environmental concerns about chemical use are mounting. Weed management is an integral part of an overall vineyard management system. Weed control in vineyards enhances the establishment of newly planted vines and improves the growth and yield of established vines. Plants on the vineyard floor influence the presence of other pests such as vertebrates, insects, mites, nematodes, and diseases. A weed management program should start before new vines are planted. The more difficult-to-control weeds (particularly perennials) are easier to manage before vines are planted. Weeds reduce vine growth and yield by competing for water, nutrients, and sunlight. Competition from weeds is most severe during the first few years after planting in areas where vine root growth is limited due to shallow or compacted soil. Weeds growing around the trunk compete directly with vine growth and provide a good habitat for field mice or voles, which can girdle and kill young vines. Gophers are most often found in non-tilled vineyards and are common where broadleaf weeds, such as field bindweed and perennial clovers, predominate. These subterranean animals feed on the roots and can weaken or kill young vines. Additionally, weeds that have dried out can become a serious fire hazard. (Yaduraju & Mishra, 2022; Angon *et. al.*, 2023; Anonymous, 2024b) ^[10, 1, 3].

Integrated Weed Management (IWM) offers a smarter path forward one that combines multiple control strategies to suppress weeds sustainably over the long term without leaning too heavily on any single method (Subhaprada Dash, *et. al.*, 2022) ^[9]. There are various methods of controlling weeds viz., cultural, mechanical, biological and chemical methods. With this background, the present study is carried out with the following specific objectives:

1. To analyse the extent of adoption of integrated weed management practices by the grape growers
2. To find out the association between the profile characteristics of grape growers with their extent of adoption of integrated weed management practices

2. Methodology

The present study was conducted in Chickaballapura and Siddlaghatta taluks of Chickaballapura district in Karnataka state during 2023-2024. Six villages in Chickaballapura taluk and six villages in Shidlaghatta taluk were randomly selected for the study. From each of the sampled village, five small farmers and another five big farmers growing grapes were again randomly selected for the study. Thus, the total sample constituted 120 grape growers (60 small farmers and 60 big farmers) from 12 villages in two taluks of Chickaballapura district. Ex-post-facto research design was followed in the present study.

Adoption is defined as the decision to make full use of innovation as the best course of action available. It is operationally defined as the degree of actual use of integrated weed management practices by grape growers. The questions pertaining to adoption level were carefully designed in consultation with horticultural experts.

The adoption test had questions covering major found in vineyards. The responses were elicited on three-point continuum namely, complete adoption, partial adoption and non-adoption of the practices of integrated weed management in grape and assigned with score of 2, 1 and 0, respectively. The following scores were assigned for full, partial and non-adoption of the recommended practices.

Response	Score
Full adoption	2
Partial adoption	1
Non adoption	0

The total score of all the aspects of adoption was computed for individual grape grower which ranges between 0 to 14. After computing the adoption score, the respondents were grouped into low, medium and high categories by taking mean and standard deviation as a measure of check.

Adoption category	Criteria
Low	< (Mean – ½ SD)
Medium	(Mean ± ½ SD)
High	> (Mean + ½ SD)

Information regarding age (X1), education (X2), experience in grape cultivation (X3), family size (X4), knowledge regarding weed management practices (X5), cropping intensity (X6), material possession (X7), annual income (X8), cosmopolitness (X9), economic orientation (X10), innovativeness (X11), risk orientation (X12), mass media participation (X13), extension participation (X14) and extension agency contact (X15).

Instruments for data collection

Considering the objectives of the study, an interview schedule was prepared after the perusal of available literature and thorough consultation with the Horticultural extension scientists. The developed schedule was pre-tested to incorporate necessary changes. The final schedule (Appendices) was used for collecting the required information from the grape growers. The respondents who were willing to provide the required information voluntarily were interviewed for the study. Personal interview was conducted during June 2024 under informal atmosphere. Each question was explained to the respondents and an equal emphasis was given in explaining all the respondents interviewed.

The collected data was scored and analyzed using frequency,

percentage, mean, standard deviation and chi-square test. In the present study, chi-square test was employed to find out the association between profile characteristics of grape growers and their extent of adoption of integrated weed management practices.

3. Results and Discussion

1. Extent of adoption of integrated weed management practices by grape growers

The findings with respect to the adoption of integrated weed management practices by grape growers are presented in Table 1.

1.1 Control of *Cynodon dactylon*

A vast majority (80.00%) of small farmers had controlled *Cynodon dactylon* by practicing hand weeding, while 15.00 per cent of them had adopted mechanical weeding for controlling *Cynodon dactylon*. With regard to chemical control, a majority of the small farmers (58.33%) had partially adopted the recommended herbicide application using glyphosate @ 10ml/L or Diuron @ 0.8 kg/acre for controlling *Cynodon dactylon*, while 35.00 per cent of them had completely adopted the recommended herbicide application for controlling *Cynodon dactylon*. However, 6.67 per cent of the small farmers had not adopted the chemical control measures for controlling *Cynodon dactylon*. None of the small farmers had practiced biological control measures for controlling *Cynodon dactylon* in grape cultivation.

Among big farmers, two-third (66.67%) of them had controlled *Cynodon dactylon* through hand weeding, whereas 31.67 per cent of them had practiced mechanical weeding for controlling *Cynodon dactylon*. Regarding chemical control, a majority of the big farmers (55.00%) had partially adopted the recommended herbicide application for controlling *Cynodon dactylon*, while 45.00 per cent of them had completely adopted the recommended herbicide application for controlling *Cynodon dactylon*. None of the big farmers had practiced biological control measures for controlling *Cynodon dactylon* in grape cultivation.

With respect to pooled sample, a majority of them (73.33%) had practiced hand weeding for controlling *Cynodon dactylon*, followed by 23.33 per cent of them had practiced mechanical weeding for controlling *Cynodon dactylon*. More than half (56.67%) of the grape growers in the pooled sample had partially adopted chemical control measures for controlling *Cynodon dactylon* followed by 40.00 per cent of them had completely adopted chemical control measures for controlling *Cynodon dactylon* and only 3.33 per cent of the grape growers in the pooled sample had not followed any chemical control measures for controlling *Cynodon dactylon* and none of the grape growers in pooled sample had followed biological control measures for controlling *Cynodon dactylon* in grape cultivation.

1.2 Control of Purple nut sedge or nut grass (*Cyperus rotundus*)

As high as 80.00 per cent of small farmers had controlled *Cyperus rotundus* by practicing hand weeding, while 15.00 per cent of them had followed mechanical weeding for controlling *Cyperus rotundus*. With regard to chemical control, a majority of the small farmers (58.33%) had partially adopted the recommended herbicide application using glyphosate @ 10ml/L or Diuron @ 0.8 kg/acre for controlling *Cyperus rotundus*, while 35.00 per cent of them had completely adopted the recommended herbicide application for controlling *Cyperus*

rotundus and the remaining 6.67 per cent of the small farmers had not followed the chemical control measures for controlling *Cyperus rotundus*. None of the small farmers had practiced biological control measures such as growing cover crops or mulching for controlling *Cyperus rotundus* in grape cultivation. Among big farmers, two-third of them (66.67%) had controlled *Cyperus rotundus* through hand weeding, whereas 31.67 per cent of them had practiced mechanical weeding for controlling *Cyperus rotundus*. Regarding chemical control, a majority of the big farmers (55.00%) had partially adopted the recommended herbicide application for controlling *Cyperus rotundus*, while 45.00 per cent of them had completely adopted the recommended herbicide application for controlling *Cyperus rotundus*. None of the big farmers had practiced biological control measures such as growing cover crops or mulching for controlling *Cyperus rotundus* in grape cultivation.

With respect to the pooled sample, nearly three-fourth (73.33%) of the grape growers had practiced hand weeding for controlling *Cyperus rotundus*, followed by 23.33 per cent of them had

practiced mechanical weeding for controlling *Cyperus rotundus*. More than half (56.67%) of the grape growers in the pooled sample had partially adopted chemical control measures for controlling *Cyperus rotundus*, followed by 40.00 per cent of them had completely adopted chemical control measures for controlling *Cyperus rotundus* and only 3.33 per cent of the grape growers in the pooled sample had not followed any chemical control measures for controlling *Cyperus rotundus*. None of the grape growers in the pooled sample had followed biological control measures such as growing cover crops or mulching for controlling *Cyperus rotundus* in grape cultivation.

It could be observed from the findings that a majority of the grape growers had controlled the weeds by hand weeding and over one-fifth of the grape growers had controlled weeds by mechanical weeding methods, besides over half of the grape growers had controlled weeds by partially adopting the chemical control measures and none of them had controlled weeds by biological measures.

Table 1: Adoption of integrated weed management practices by grape growers

Sl. No.	Particulars	Grape growers					
		Small farmers (n ₁ =60)		Big farmers (n ₂ =60)		Pooled sample (n ₃ =120)	
		No.	%	No.	%	No.	%
I	Control of <i>Cynodon dactylon</i>						
A	Cultural control						
a.	Practiced hand weeding	48	80.00	40	66.67	88	73.33
B	Biological control						
a.	Grown cover crops	0	0	0	0	0	0
b.	Practiced mulching	0	0	0	0	0	0
C	Mechanical control						
a.	Practiced mechanical weeding	9	15.00	19	31.67	28	23.33
D	Chemical control						
a.	Sprayed glyphosate @ 10ml/L or Diuron: 0.8 kg/acre						
1.	Complete adoption	21	35.00	27	45.00	48	40.00
2.	Partial adoption	35	58.33	33	55.00	68	56.67
3.	Non adoption	4	6.67	0	0	4	3.33
II	Control of Purple nut sedge or nut grass (<i>Cyperus rotundus</i>)						
A	Cultural control						
a.	Practiced hand weeding	48	80.00	40	66.67	88	73.33
B	Biological control						
a.	Grown cover crops	0	0	0	0	0	0
b.	Practiced mulching	0	0	0	0	0	0
C	Mechanical control						
a.	Practiced mechanical weeding	9	15.00	19	31.67	28	23.33
D	Chemical control						
a.	Sprayed glyphosate @ 10ml/L or Diuron: 0.8 kg/acre						
1.	Complete adoption	21	35.00	27	45.00	48	40.00
2.	Partial adoption	35	58.33	33	55.00	68	56.67
3.	Non adoption	4	6.67	0	0	4	3.33

Grape growers have realized the harmful effects of the use of herbicides which affect the soil health. Hence, majority of them had controlled the weeds by hand weeding and by mechanical weeding. Probably, due to shortage of labour, high labour wages to remove the weeds and lack of knowledge about biological control measures, the grape growers had used herbicides to control the weeds in the vineyards. and the results were in line with the Singh, *et. al.*, 2018 ^[7].

2. Overall adoption of integrated weed management practices by grape growers

It is observed from Table 2 that a greater proportion of the small farmers (40.00%) had low level of overall adoption of integrated weed management practices, whereas 33.33 and 26.67 per cent

of the small farmers had medium and high level of overall adoption of integrated weed management practices, respectively. With respect to big farmers, over one third (33.33%) per cent of the grape growers had high level of overall adoption of integrated weed management practices, whereas 33.33 and 31.67 per cent of the big farmers had low and medium level of overall adoption of integrated weed management practices, respectively. As high as 36.66 per cent of the grape growers in the pooled sample had a low level of overall adoption of integrated weed management practices, whereas 32.50 and 30.84 per cent of grape growers in had a medium and high level of overall adoption of integrated weed management practices.

The result in Table 2 reveals that over two-third of the small and big farmers belonged to low to medium overall adoption level of

integrated weed management practices. Non-adoption of biological control measures and partial adoption of mechanical and chemical control measures could be the reasons for majority of small and big farmers falling under low to medium overall adoption level of integrated weed management practices.

Integrated weed management is one of the vital components of sustainable grape production, ensuring effective weed control, while minimizing environmental hazards. Important sub-components of integrated weed management include cultural, mechanical, biological, and chemical control measures. Therefore, there is a need to further promote awareness, training, and accessibility to these components among the grape growers by the extension personnel to enhance weed management efficiency and achieve sustainable grape production. The findings of this study are in line with the findings of Rajashekar, *et al.*, (2017) [8], Anil Mandloi *et al.* (2017) [2] and Maratha and Badodiya (2018) [5].

Table 2: Overall adoption of integrated weed management practices by grape growers

Sl. No.	Adoption categories	Grape growers					
		Small farmers (n ₁ =60)		Big farmers (n ₂ =60)		Pooled sample (n ₃ =120)	
		No.	%	No.	%	No.	%
1.	Low	24	40.00	20	33.33	44	36.66
2.	Medium	20	33.33	19	31.67	39	32.50
3.	High	16	26.67	21	35.00	37	30.84
	Total	60	100.00	60	100.00	120	100.00

3. Test of significance of mean adoption score of integrated weed management practices between small and big farmers

The results in Table 3 reveal that the mean adoption score of big farmers (7.12) was slightly higher compared to the mean adoption score of small farmers (6.89) in respect of integrated weed management practices, however the 't' value (0.09) showed a non-significant difference in respect of mean adoption score of integrated weed management practices between small and big farmers. The results revealed that there is no significant difference in the mean adoption score of integrated weed management practices between small and big farmers.

Table 3: Test of significance of mean adoption score of integrated weed management practices between small and big farmers

Farmers	Mean adoption score	't' value
Small farmers (n ₁ = 60)	6.89	0.09 ^{NS}
Big farmers (n ₂ = 60)	7.12	

NS = Non-significant

4. Association between profile characteristics of grape growers with their adoption of integrated weed management practices

Table 4 presents the data on the association between the profile characteristics of grape growers with their adoption of integrated weed management practices.

The results in the table 4 reveals that the variables like family size, cropping intensity, material possession and annual income did not show significant association with the adoption of integrated weed management practices, while age, experience in grape cultivation, cosmopolitaness, risk orientation and mass media participation were found to be having a significant association with the adoption level at five per cent. Education, knowledge regarding weed management practices, economic orientation, innovativeness, extension participation and

extension contact exhibited a highly significant association with the adoption of integrated weed management practices at one per cent level. The findings of this study are in line with the findings of Leela Rani, *et al.*, (2016) [6] and Singh, *et al.* (2018) [7].

Table 4: Association between profile characteristics of grape growers with their adoption of integrated weed management practices (n=120)

Sl. No.	Profile characteristics	Chi-square
X1	Age	9.999*
X2	Education	14.820**
X3	Experience in grape cultivation	12.680*
X4	Family size	3.001NS
X5	Knowledge regarding weed management practices	15.692**
X6	Cropping intensity	2.612 ^{NS}
X7	Material possession	1.099 ^{NS}
X8	Annual income	0.999 ^{NS}
X9	Cosmopolitaness	11.992*
X10	Economic orientation	16.202**
X11	Innovativeness	15.692**
X12	Risk orientation	13.016*
X13	Mass media participation	9.969*
X14	Extension participation	17.969**
X15	Extension contact	18.680**

NS = Non-significant, * = Significant at 5%, ** = Significant at 1%

Conclusion

Mass media (Television, radio, newspaper, farm magazines, internet, *etc.*) should cover useful and practical messages on grape cultivation besides frequent contact of grape growers with horticultural extension personnel and regular participation in extension activities (farm and home visit, demonstration, exhibition, campaigns, conventions, field days *etc.*) would help the grape growers in increasing the adoption of integrated weed management practices.

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