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A study on adoption pattern of fertilizers by grape growers in Karnataka

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Abstract

One hundred and twenty grape growers from Chikkaballapur district of Karnataka state were interviewed to analyse the extent of adoption of fertilizers. The results revealed that three-fourth (74.16%) of grape growers were belonging to low to medium level of adoption of fertilizers. Extension participation, extension agency contact, economic orientation, education, mass media participation, cosmopolitaness and risk orientation of grape growers were found significantly contributing to the adoption of fertilizers. All the seven variables together contributed to 63.33 per cent of the variation in the adoption of fertilizers in grape cultivation.

Keywords: Grape, fertilizers, adoption, stepwise regression analysis

Introduction

Grapes are a commercially significant crop, especially in the sub-tropical and tropical climates. While, it is originally a temperate crop, grape cultivation has adapted well to India's diverse climatic conditions. The most commonly cultivated grape variety in India is Thompson Seedless, covering about 55 per cent of the total grape-growing area. Other varieties include Bangalore Blue (15%), Anab-e-Shahi, Dilkush (15%), Sharad Seedless (5%), Perlette (5%), and smaller shares form Gulabi and Bhokri varieties. Grape cultivation has become a profitable agribusiness in India, especially in the states of Maharashtra and Karnataka, with the potential to contribute significantly to India's agricultural economy. The adaptability of grape varieties to different climates and their diverse uses makes it a highly versatile crop for Indian farmers. Karnataka state grows several grape varieties, with the three main ones being Thompson Seedless, Anab-E-Shahi (Dilkush) and Bangalore Blue. Grape cultivation is spread across 18 out of 30 districts in the state, with prominent growing regions such as Nandi Valley, Cauvery Valley, and Krishna Valley. The state's favorable climate is ideal for grape production, which supports a healthy industry with many vineyards and consistent production of high-quality grapes each year. Chikkaballapura district is a major site for grape, grain, and silk cultivation. The district has 2449.69 ha of area under grape cultivation with production of 81331.10 metric tonnes of grape (Angon *et. al.*, 2023; Anonymous, 2024a; Anonymous, 2024b; Dechamma *et. al.*, 2022) ^[2, 3, 4, 6].

Grapevine nutrition has been a major focus for increasing grapes quality, productivity, and the way of minimizing the gap between actual and potential grape yield. Several nutrient elements are reported to influence grapevine physiological growth, yield, and grape quality. Globally, fertilizers with different NPK ratios and micronutrients are used to achieve a better yield and desirable quality of grapes. The deficiency of mineral nutrients results in chlorosis and eventual necrosis of leaves, which affect vine growth, yield, and grape quality in terms of sugar and polyphenols contents, consequently compromising wine quality and other grape-derived products. Thus, the establishment of the vineyard fertilizer program should be nutrient-specific, which takes into account vineyard management strategies that influence nutrient use efficiency from fallen leaves, pruning, soil testing, plant analysis, and other factors that affect yield and quality. However, applying mineral nutrients to grapevines may interfere with the physicochemical composition of grapes and derived products. Against this background, the

present study has been taken up with the following specific objectives:

1. To find out the extent of adoption of fertilizers by grape growers
2. To find out the relative importance of selected characteristics of grape growers in explaining the adoption of fertilizers in grape cultivation

Methodology

The study was carried out in Chikkaballapura and Shidlaghatta taluks of Chikkaballapura district in Karnataka state during 2023-2024. Six villages in Chikkaballapura taluk and six villages in Shidlaghatta taluk were randomly selected for the study. From each of the sampled village, ten grape growers were randomly selected for the study. Thus, the total sample constituted 120 grape growers from 12 villages in two taluks of Chikkaballapur district. Ex post facto research design was followed for the present research study (Ashwini, *et. al.*, 2018; Anand, *et. al.*, 2024) ^[5, 1].

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 fertilizers by grape growers. The questions pertaining to adoption level were carefully designed in consultation with Horticulture scientists. The adoption test had questions covering major nutrients such as nitrogenous, phosphorous and potash fertilizers. The responses were elicited on three-point continuum namely, complete adoption, partial adoption and non-adoption of the practices of integrated nutrient management in grape. The following scores were assigned for full, partial and non-adoption of the fertilizers.

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 24. After computing the adoption score, the respondents were grouped into low, medium and high categories by taking mean and half standard deviation as a measure of check.

Adoption category	Criteria	Grape growers (score)
Low	< (Mean – ½ SD)	< 16.37
Medium	(Mean ± ½ SD)	16.37-19.03
High	> (Mean + ½ SD)	> 19.03
Mean		17.70
Standard deviation		2.66

Information regarding age (X1), education (X2), experience in grape cultivation (X3), family size (X4), knowledge regarding fertilizers (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) of grape growers were collected using a pre tested interview schedule.

The collected data were scored and analyzed using frequency, percentage, mean, standard deviation and stepwise regression analysis. In the present study, stepwise regression analysis technique was applied to select the best regression equation and to identify the best characteristics/variables for predicting the maximum variation contributing for the adoption of fertilizers in grape cultivation.

Results and Discussion

1. Adoption of fertilizers by grape growers

The findings with respect to the adoption of fertilizers by grape growers are presented in Table 1.

1.1. Application of Nitrogenous (N) fertilizer

A vast majority of the grape growers (83.33%) had partially adopted the recommended quantity of nitrogenous fertilizer during summer pruning, while only 16.67 per cent of the grape growers had completely adopted the application of nitrogenous fertilizer during summer pruning. A vast majority of the grape growers (83.33%) had partially adopted the recommended quantity of nitrogenous fertilizer during winter pruning, while only 16.67 per cent of the grape growers had completely adopted the application of nitrogenous fertilizer during winter pruning. Cent per cent of the grape growers who had applied nitrogenous fertilizer had followed the recommended method and time of application by applying nitrogenous fertilizer in trenches during summer pruning and winter prunings.

1.2. Application of Phosphorus (P₂O₅) fertilizer

A great majority of the grape growers (69.17%) had partially adopted the recommended quantity of phosphorus fertilizer during summer pruning, while 30.83 per cent of the grape growers had completely adopted it to the grape gardens. A majority of the grape growers (65.00%) had partially adopted the recommended quantity of phosphorus fertilizer during winter pruning, while 35.00 per cent of the grape growers had completely adopted the application of phosphorus fertilizer during winter pruning.

All the grape growers who had applied phosphorus fertilizer had followed the recommended method and time of application by applying phosphorus fertilizer in trenches during summer and winter prunings.

1.3. Application of Potash (K₂O) fertilizer

A great majority of the grape growers (90.00%) had partially adopted the recommended quantity of potash fertilizer during winter pruning, while only ten per cent of the grape growers had completely adopted the application of potash fertilizer during winter pruning. A great majority of the grape growers (86.67%) had partially adopted the recommended quantity of potash fertilizer after 60 days of winter pruning, while only 13.33 per cent of the grape growers had completely adopted the application of potash fertilizer after 60 days of winter pruning. Cent per cent of the grape growers who had applied potash fertilizer had followed the recommended method and time of application by applying potash fertilizer in trenches during winter pruning and 60 days after winter pruning.

It could be observed from the results of Table 1 that, with regard to nitrogenous, phosphorous and potash fertilizers application, majority of grape growers had partially adopted the recommended quantity of nitrogenous, phosphorous, and potash fertilizers. Lack of knowledge on the recommended dosage and financial constraints were the major reasons for partial adoption

of NPK fertilizers. The method and timing of application were followed by all the grape growers indicating that they had good knowledge and awareness about the method and time of application.

Table 1: Adoption of fertilizers by grape growers (n=120)

Sl. No.	Particulars	Grape growers	
		No.	%
I	Application of Nitrogenous (N) fertilizers		
A.	Quantity of Nitrogenous (N) fertilizer applied		
1.	Applied 600g/plant during summer pruning		
a.	Complete adoption	20	16.67
b.	Partial adoption	100	83.33
c.	Non adoption	0	0
2.	Applied 400g/plant during winter pruning		
a.	Complete adoption	20	16.67
b.	Partial adoption	100	83.33
c.	Non adoption	0	0
B.	Method and time of application of Nitrogenous (N) fertilizer		
a.	Applied in trenches during summer pruning	120	100.00
b.	Applied in trenches during winter pruning	120	100.00
II	Application of Phosphorus (P ₂ O ₅) fertilizers		
A.	Quantity of Phosphorus (P ₂ O ₅) fertilizers applied		
1.	Applied 250g/plant during summer pruning		
a.	Complete adoption	37	30.83
b.	Partial adoption	83	69.17
c.	Non adoption	0	0
2.	Applied 250g/plant during winter pruning		
a.	Complete adoption	42	35.00
b.	Partial adoption	78	65.00
c.	Non adoption	0	0
B.	Method and time of application of Phosphorus (P ₂ O ₅) fertilizers		
a.	Applied in trenches during summer pruning	120	100.00
b.	Applied in trenches during winter pruning	120	100.00
III	Application of Potash (K ₂ O) fertilizers		
A.	Quantity of Potash (K ₂ O) fertilizers applied		
1.	Applied 750g/plant during winter pruning		
a.	Complete adoption	12	10.00
b.	Partial adoption	108	90.00
c.	Non adoption	0	0
2.	Applied 750g/plant after 60 days of winter pruning		
a.	Complete adoption	16	13.33
b.	Partial adoption	104	86.67
c.	Non adoption	0	0
B.	Method and time of application of Potash (K ₂ O) fertilizers		
a.	Applied in trenches during winter pruning	120	100.00
b.	Applied in trenches 60 days after winter pruning	120	100.00

2. Overall adoption of fertilizers by grape growers

It is observed from Table 2 that a greater proportion of the grape (46.66%) had a medium level of overall adoption of fertilizers, whereas 27.50 and 25.84 per cent of the grape growers had a low and high level of overall adoption of fertilizers, respectively. It could be inferred that a majority of grape growers (74.16%) were belonging to low and medium overall adoption of fertilizers.

Fertilizers play a vital role in supplying essential nutrients like nitrogen, phosphorus, and potassium to the vineyard, which are crucial for plant growth and higher yields. They provide nutrients in an immediately available form, ensuring rapid absorption by crops and promoting uniform growth. Balanced application of fertilizers enhances nutrient efficiency, leading to improved productivity and better crop quality. The use of fertilizers supports optimal plant development, ensuring timely flowering, fruiting, and overall yield enhancement of grapes.

The results are in line with the Raghuprasad *et. al.*, 2023 ^[9]; Priya James *et. al.*, 2025 ^[8].

Table 2: Overall adoption of fertilizers by grape growers (n=120)

Sl. No.	Category	Grape growers	
		No.	%
1.	Low (< 16.37 score)	33	27.50
2.	Medium (16.37-19.03 score)	56	46.66
3.	High (>19.03 score)	31	25.84
	Total	120	100.00
	Mean		17.70
	Standard deviation		2.66

3. Stepwise regression analysis showing the significant steps predicting the percentage contributions of selected characteristics in the adoption of fertilizers by grape growers

Table 3 reveals that out of 15 characteristics only seven variables viz., extension participation (X14), extension agency contact (X15), economic orientation (X10), education (X2), mass media participation (X13), cosmopolitaness (X9) and risk orientation (X12) entered the final stage of stepwise regression.

Table 3: Stepwise regression analysis showing the significant steps predicting the percentage contributions of selected characteristics in the adoption of fertilizers by grape growers (n=120)

Step No.	Characteristics entering regression	Degrees of freedom	't' value	Percentage of variation explained by regression (R ²)
1	X14	118	29.62	36.63
2	X14, X15	117	21.22	46.61
3	X14, X15, X10	116	26.38	47.81
4	X14, X15, X10, X2	115	24.68	49.24
5	X14, X15, X10, X2, X13	114	23.99	52.63
6	X14, X15, X10, X2, X13, X9	113	27.26	53.69
7	X14, X15, X10, X2, X13, X9, X12	112	28.11	55.18

R²=0.797; F=20.62 (Significant at one per cent level)

A single factor in the first step is the extension participation (X14) contributing 36.63 per cent of the variation in the adoption of fertilizers. The percentage of variation as expressed by regression equation (R²) is shown in Table 3. All the seven variables together contribute to 79.70 per cent of the variation in the adoption of fertilizers in grape cultivation. The results are in line with the results of Mohamed Ghali *et.al.*, 2022 ^[7];

4. Stepwise regression analysis showing the final step with all the significant characteristics included in the adoption of fertilizers by grape growers

The results in Table 4 reveals the analysis of regression coefficients, standard error and 't' values. The 'F' value (26.28) was highly significant at one per cent level indicating the significance of regression equation in predicting the adoption level of fertilizers in grape cultivation. Characteristics like extension participation (X14), extension agency contact (X15), economic orientation (X10), education (X2), mass media participation (X13), cosmopolitaness (X9) and risk orientation (X12) were found significantly contributing for the adoption level of fertilizers in grape cultivation in the final stepwise regression analysis. The results are in line with the findings of Mohamed Ghali *et.al.*, 2022 ^[7];

Table 4: Stepwise regression analysis showing the final step with all the significant characteristics included in the adoption of fertilizers by grape growers (n=120)

Variable No.	Characteristics	Regression co-efficient	Standard error or regression co-efficient	't' value
X14	Extension participation	0.2459	0.0391	5.28
X15	Extension agency contact	0.3112	0.1052	3.83
X10	Economic orientation	0.6283	0.1920	4.81
X2	Education	0.7193	0.1149	6.12
X13	Mass media participation	0.8189	0.1890	2.85
X9	Cosmopolitaness	0.8891	0.1920	5.99
X12	Risk orientation	0.8009	0.1061	3.99

F=26.28 (Significant at one per cent level)

Conclusion

The findings of the research study showed that about three-fourth (74.16%) of grape growers were belonging to low to medium level of adoption of fertilizers. To promote the balanced use of fertilizers, extension agencies should conduct training programs, on-farm demonstrations, farmer field schools etc., to showcase their proper application. Awareness campaigns through mass media and farmer meetings can also highlight the importance of nutrient balance and sustainable grape farming practices. Involvement of agricultural research institutions, input suppliers, farmer producer organizations etc., would go a long way in educating farmers on judicious use of fertilizer leading to adoption of the same in the field.

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