INFLUENCE OF SOP ON GROWTH, YIELD AND QUALITY CHARACTERS OF GRAPES cv. MUSCAT

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ABSTRACT

The field study was conducted to find out the "Influence of SOP on growth, yield and quality characters of grapes cv. Muscat". The potassium fertilizer was given as soil application and foliar spray in the form of sulphate of potash (SOP) along with recommended dose of nitrogen and phosphorus at 0, 200, 400, 600, 800, 1000 grams per vine, and also (T_7) 600 grams + 0.5% of foliar spray, (T_8) 600 grams + 1% of foliar spray application at pea and marble stage application is done to find the response of potash on grapes. The potassium application as 600 grams along with 0.5% foliar spray shows the best results in leaf area index, total chlorophyll, total sugars, reducing sugars, non reducing sugars, juice content, total soluble solids, pH of juice and least acidity level was also observed and this treatment also recorded the maximum diameter of berries, length and width of bunch than the other treatments. It also shows the maximum yield of (27.37 t ha^{-1}) and also enhances the shelf life by retaining grape berries in the stalk for about 9 days from harvest.

Key words: Grapes, SOP, Yield, Quality and Shelflife.

INTRODUCTION:

Grape (*Vitis vinifera*) is one of the most delicious, refreshing and nourishing subtropical fruits. The berries are a good source of minerals and vitamins (B_1, B_2 and C). The fruits are consumed in fresh forms as a table fruit and in the processed form as wine,

raisin and fresh juice. In India, 78 per cent of grape produced are used for table purposes, nearly 17-20 percent is dried for raisin production, while the remaining 2 percent is used for manufacturing of juice and wine. Grapes are grown in Punjab, Haryana, Maharastra, Karnataka and Tamilnadu in the southern part of India.

Grape is cultivated over an area of 8.94 million hectares in the world with an annual production of 67.22 million tonnes. In India, it is cultivated over an area of 1685.3 thousand hectares with an annual production of 2270 million tonnes. Tamilnadu occupies the maximum productivity as 29.8 tonnes per hectare and Maharashtra accounts for more than 75.3% of the total production (Bijay kumar, 2009). The popular grape varieties of South India are Muscat, Thompson Seedless, Anab-e-Shahi and Bangalore Blue.

Balanced fertilization is the only way for enhancing the crop productivity in a sustainable manner (Lester *et al*., 2007). Nutrients influence on growth and yield of grapes through vigorous and healthy growth of vines during pre-initiation stage of floral primordial stage and slow growth during the fruit bud differentiation stages are favourable for productivity. Potassium has direct role on photosynthesis, meristematic growth, chlorophyll synthesis, increase disease resistance in plant and improves quality of grapes (Singh *et al*., 2005).

Fertilizer offers the best means of increasing yield and maintaining soil fertility. The main major nutrients N, P_2O_5 and K_2O are essential for higher yield of any crop (Shikhamany, 1982). Potassium sulphate has an important role in grape cultivation, as it recommended as high as 800 kg K_2O ha^{-1}. Beside soil application of potash as twice a year, weekly sprays of potassium sulphate solution have been reported to improve

various quality characters. Keeping these facts in view, a study was undertaken to study the effect of potassium on growth, yield and quality characters of grapes.

MATERIALS AND METHODS:

An investigation was carried out at Surulipatti village, near Theni district of Tamilnadu to study the "Influence of SOP on quality character of grapes cv. Muscat". The experiment was laid out in Randomised Block Design (RBD) with three replication for each treatment. The growth parameters like leaf area index(cm^2), total chlorophyll content (mg g^{-1}), dry matter production (grams) and yield attributes like number of quality berries per bunch, number of berries per bunch, diameter of berries (cm), yield per hectare and the quality attributes like Total sugars, Reducing sugars(%), Non-reducing sugars (%), Titratable acidity (%), Juice content(%), Total soluble solids (°Brix), Physiological loss in weight (PLW) were recorded periodically. The titratable acidity of juice was determined by titrating freshly extracted juice against 0.1N Sodium hydroxide (NaOH) solution and standardized against tartaric acid using phenolphthalein indicator. The juice content of the berries is observed by taking 100 grams of berries in a vessel for making it into juice formulation and then it is filtered to remove the skin and seed from the juice extract and calculate the juice content percentage in 100 grams of berry and it is expressed in percentage. The juice from the berries was extracted by squeezing the berry, the first two drops were discarded. The third drop was taken over the hand refractometer and recorded the TSS.

DETAILS OF TREATMENT:

Treatment	Levels of NPK composition (gm $vine^{-1}$)			
	N	P	K	Foliar spray of SOP
T_1 Control	200	160	-	-
T_2	200	160	200	-

T_3	200	160	400	-
T_4	200	160	600	-
T_5	200	160	800	-
T_6	200	160	1000	-
T_7	200	160	600	+ 0.5% SOP foliar spray @ initial fruit setting period and 15 days after first spray.
T_8	200	160	600	+ 1% SOP foliar spray @ initial fruit setting period and 15 days after first spray.

RESULTS AND DISCUSSION

The leaf area index in the present study was improved due to application of potassium fertilizer in the form of sulphate of potash both means of soil and foliar application. The result on the leaf area index was found to be statistically significant in all treatments when compared to control. However, the leaf area was found to be highest in (T_8) 600 gm vine^{-1} + (0.5% SOP) as foliar spray at 1st week of fruit setting period and 2nd on 15 days after first spray.

The highest chlorophyll content (1.98 mg g^{-1}) was observed in (T_8) followed by treatments (T_7) as 1.93mg-^{1} and the lowest chlorophyll content was recorded in the treatment(T_1) as 1.62 mg g^{-1}. The total chlorophyll content was high in the treatment (T_8) (600 gm/vine + 0.5% SOP as foliar spray at 1st week of fruit setting period and 2nd on 15 days after first spray) has (2.03 mg/gm) highest leaf chlorophyll. Similar finding were also reported in Apple trees by (Shahin *et al*., 2010).They observed that the best results were obtained due to chlorophyll content increases on the leaf tissue by means of spraying potassium fertilizer.

The highest dry matter content was observed in the (T_8) (32.40%) followed by the treatment (T_7) as (31.91%) and the lowest dry matter production was recorded in control

(T_1) as (29.02 %). This result was in line with the reports of Sekarappa (1994) and revealed that the increased levels of potash effects on the dry matter productivity of fruits and vegetable parts.

The maximum number of bunches (26.08) were observed in (T_7) was followed by (T_8) with (26.01) bunches in the present experiment was in accordance with the report of Srinivasan (1968). He noted the application of potash fertilizer singly resulted in the advanced bud development and hence the number of bunches seems to be increased.

The diameter of berries seems to be increased in the treatment (T_7), It may be due to foliar application of potash at anthesis and development stage results in good absorption of potash nutrient spray at the flowering period shows the best result on increasing the berry diameter by pulp content in the grape berry.

Highest yield of 27.37 tons ha^{-1} was obtained in (T_7). It may be due to the reason that potassium enhances the chlorophyll, which is essential to perform the photosynthetic process and also important for the normal metabolic pathway in the plant cells for boosting the yield of fruits crops. (Salem *et al*., 2007).

The titratable acidity of berries seems to be reduced due to application of potassic fertilizer in soil (600gm) along with the foliar application of potassium at 0.5 % percent than the other treatments (T_7). The acidity of grapes are very important to determine the consumption rate of grapes by consumers. The data are in conformity with the findings of Kumar *et al*., (2008) in papaya.

The highest juice percentage was found it the treatment (T_7). It is evident from these results that sulphate of potash had better effect on the increase of juice formation in

the berries compared to murate of potash. Potassium helps in the photo-phosporylation, transportation of photo assimilates from phloem to xylem enhances enzyme activation. Potash also helps in reducing the transpiration loss and helps to prevent the loss of juice content in fruit juice as reported by Acevedo *et al*., (2004).

The maximum TSS was observed in the treatment (T_7) when compared with other treatment.The maintenance of TSS in stored fruit may be due to decline in hydrolytic enzymes that are associated with the fruit spoilage (Balakrishnan, 1996) Potassium also known to help in sugar translocation in papaya plants, and there by increases TSS Kumar *et al*., (2006).

The minimum physiological loss in weight was recorded in the treatment (T_7) and maximum was recorded in the treatment (T_1). The berry continues to lose water by transpiration which leads to the reduction of fresh berry mass and volume and an increase in the sugar concentration of the berry (Wang *et al*., 2003).

The highest pH of juice was recorded in the (T_7) treatment and followed by (T_8). Potassium application, especially after flowering shows imports of K from leaves via phloem and it enhances quality as TSS and pH on juice content (Mpelasoka *et al*., 2003).

CONCLUSION:

The plants treated with potassium fertilizer at the rate of 600 grams as soil application combined with 0.5%, foliar application (T_7) at two different stages increased the shelf life and also registered low physiological loss in weight (PLW), and also recorded highest yield.

Treatment	Level of fertilizer composition (g/vine)			Number of bunches vine-1	Yield vine-1 (kg)
	N	P	K		
T_1	200	160	-control-	30.76	30.95
T_2	200	160	200	31.72	32.40
T_3	200	160	400	32.68	35.25
T_4	200	160	600	34.63	33.70
T_5	200	160	800	35.59	38.20
T_6	200	160	1000	33.67	36.65
T_7	200	160	600 + 0.5% foliar spray of SOP	36.55	41.10
T_8	200	160	600 + 1% foliar spray of SOP	37.51	39.80
SE(d)				0.75	0.575
CD (p=0.05)				0.37	1.15

Treatment	Level of fertilizer composition (g/vine)			Leaf area index(cm^2)
	N	P	K	
T_1	200	160	-Control-	235.01
T_2	200	160	200	239.01
T_3	200	160	400	243.01
T_4	200	160	600	247.60
T_5	200	160	800	256.01
T_6	200	160	1000	251.83
T_7	200	160	600 + 0.5% foliar spray of SOP	264.43
T_8	200	160	600 + 1% foliar spray of SOP	260.20

Effect of potassium on juice content (%) , total soluble solids (º Brix) and shelf life of grapes cv. Muscat.

Treatment	Level of fertilizer composition (g/vine)			Juice content (%)	TSS (° Brix)	Shelf life (days)	PLW
	N	P	K				
T_1	200	160	-control-	72.09	13.09	5.19	12.17
T_2	200	160	200	75.57	13.99	6.12	11.66
T_3	200	160	400	76.82	14.89	6.54	11.13
T_4	200	160	600	77.92	16.69	8.10	10.14
T_5	200	160	800	81.74	17.58	7.46	10.63
T_6	200	160	1000	79.90	18.57	7.01	9.59
T_7	200	160	600 + 0.5% foliar spray of SOP	85.01	20.72	9.01	8.50
T_8	200	160	600 + 1% foliar spray of SOP	83.87	19.80	8.41	9.02
SE(d)				0.50	0.425	0.16	0.24
CD(p=0.05)				0.01	0.85	0.32	0.47

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