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## Effect of Ecklonia Maxima on yield and quality in Manik Chaman Grapes (*Vitis vinifera* L.)

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### Abstract

Field experiment was conducted during the fruiting season of 2021-22 to test the efficacy of Basfoliar Kelp O SL on Manik Chaman clone of Thompson Seedless grapevines at farmer's field (located at latitude 17.674553 °N and the longitude is 75.323723 °E). Basfoliar Kelp O SL (Ecklonia maxima) was applied at 1.50 ml; 3.00 ml; 6.00 ml per liter of water respectively along with market standard quikon at 2.00 ml per liter of water, during berry development stages. The result revealed that foliar application of Basfoliar Kelp O SL (Ecklonia maxima) had significant impact on pedicel thickness, average bunch weight, 10 berry weight, berry diameter, berry length, yield per vine and berry quality parameters total soluble solids, titratable acidity in grapes. The foliar application of Basfoliar Kelp O SL (Ecklonia maxima) at 3.00 ml per liter of water was optimum to obtain the desired quality parameters in grapes.

**Keywords:** Bio-stimulant, Ecklonia maxima, yield, quality, and grapevines

### 1. Introduction

Grape (*Vitis vinifera* L.) is one of the most important fruit crops having economic importance and it was grown in temperate to warm regions; however, hot and dry climate is ideal. In India approximately, covering an area of 155.30 thousand hectares occupying 2.24 % of the total area in 2020-21. The country is also a major exporter 263,075.67 MT of fresh grapes to the world worth of Rs. 2,302.16 crores/ 305.66 USD Millions during the year 2021-22. Among the country, Maharashtra is the leading grape producing state accounting for more than 71 % of total production followed by Karnataka, Tamilnadu and Mizoram 2020-21 (APEDA). In India, more than 20 varieties are under cultivation. However, only a dozen are commercially grown. Presently, Thompson Seedless is the dominant grape variety occupying 78.96% of the area with its clones. 2A-Clone occupies approximately 5% of the total area while TAS-A-Ganesh and Manik Chaman constitute 4.5% and 3.5% respectively. At present, the challenges to growers are to produce a quality grape which constitutes berry size, length, berries must be firm, firmly attached to the stalk, color development, sugar accumulation, bunch health and keeping qualities for packaging. Considering this, the present research plan to produce a quality grape. Thus, the Bio-stimulants are used as to regulate plant growth and produce a quality grape. The Basfoliar Kelp O SL is a natural and organic sea plant liquid extract of Kelp family (Ecklonia maxima). The species Ecklonia maxima, also known as seaweed bamboo, its extract has been used in agriculture as bio-stimulant (Stirk *et al.*, 2004) [14] and polyamines putrescin and spermin (Papenfus *et al.*, 2013) [11]. Basfoliar Kelp O SL (Ecklonia maxima) agro-chemicals was recently introduced by Dhanshree Agrochemicals, Pune, India for attaining higher values of yield and quality parameters in grapes. The endemic kelp species is sustainably sourced from the coastline of the South African cape where condition maximize the content of phyto-active substances. The phenomenal impact of Basfoliar Kelp O SL is on root growth and development, increasing leaf size, enhancing photosynthetic efficiency, flower and fruit setting, increasing fruit size and colour development in grapes. Literature survey revealed that the application of biostimulant or sea weed extract positively influencing on growth productivity and fruit quality in fruit crops (Abada, 2002) [1], (Abd El-Wahab, 2007) [4], (Abd El-Ghany *et al.*, 2001) [2], (Abd El-Motty *et al.*, 2010) [3] and in Black gram (Dwivedi *et al.*, 2014) [6], (Lombard and Lourens 2007; Orellana, 2007) [8]. Though, bio stimulants serve to be very effective in plant growth and enhancing crop yield but since soil acts as an ultimate sink for all the chemicals applied on it. Therefore, even slightly higher concentration can harm the next crop in rotation or may also leach down to contaminate ground water resources. Hence, a detailed study was therefore, conducted to evaluate the effect of Basfoliar Kelp O SL on yield and quality in grapevines.

## 2. Materials and Methods

### 2.1 Procurement of Chemicals

The bio stimulant, Basfoliar Kelp O SL (*Ecklonia maxima*) was obtained from M/s Dhanashree Agrochemicals Pvt., Ltd., Pune, India. All other market standards were procured from local market.

### 2.2 Field Experiment

Field experiment was conducted on *Vitis vinifera* L. (cv. Thompson Seedless) clone Manik Chaman at the farmer's field of Kasegaon, Tal- Pandharpur, Dist. – Solapur (17.674553°N and the longitude is 75.323723°E). The experiment was carried out with five treatments with four replications during fruiting seasons of 2021 – 22. The applications of Basfoliar Kelp O SL (*Ecklonia maxima*) was done at the rate of 1.50 ml/l, 3.00 ml/l, 6.00 ml/l respectively; Quikon at 2.00 ml/l and untreated control. The application was done by using knapsack sprayer at berry development stages (2-3 mm as first application, 6-8 mm as a second application, 10-12 mm third application). The data obtained for this study were analyzed as per Panse and Sukhatme (1967) [10]. The observations recorded for average bunch weight, 10 berry weight were taken by using an electronic bench top balance and Pedicel thickness, Berry diameter and Berry length were measured by using digital vernier caliper 0-300 mm. The total soluble solids (TSS) was recorded by hand refractometer model (ERMA, Japan). The titratable acidity was determined using 0.1 M NaOH and titrated to the end point of colorless to pink using phenolphthalein indicator and yield attributes were measured at the time of harvest. The experimental plot was well maintained by good agricultural practices. Bunches were harvested as per the maturity index. The number of bunches per vines were recorded at 3-4 mm berry development stage, whereas the observations on yield and quality parameters were recorded after the harvest in all the treatments.

### 2.3 Statistical analysis

The various data collected were subjected to analysis of variance in randomized complete block design (RBD) using SAS software version 9.2 with a generalized linear model (GLM) procedure. Means were separated using least significant differences (LSD) test at 5% level of significance.

## 3. Result and Discussion

### 3.1 Effect of Basfoliar kelp O SL (*Ecklonia maxima*) on Yield parameters in grapes

The observations recorded on the yield and quality parameters were presented in Table 1. Significant differences were observed in average bunch weight, 10 berry weight berry length, berry diameters, and pedicel thickness. The highest average bunch weight was recorded with the application of Basfoliar kelp O SL @ 3.00 ml/ liter of water (358.80 g) followed by Basfoliar kelp O SL @ 6.00 ml/ liter of water (340.00) whereas, the least average bunch weight was recorded with the untreated control (307.15 g). Similar results were obtained for 10 berry weight in this investigation. These results obtained in this study might be due to the application of Basfoliar kelp O SL (*Ecklonia maxima*) which might increase the shoot vigour was positively correlated with leaf index area. An increase in leaf area index during the development of bunch, the bunch act as a sink while the leaf

area act as a source where the photosynthesis occurs. Hence, the leaf area plays an important role in feeding the development bunches. The increase in the total leaf area might store more food materials through photosynthesis and transport to sink (bunch). Similarly, Somkuwar *et al.* (2013) [13] reported that an increasing leaf area resulted into high active photosynthetic rate which helps to fulfil the demand of carbohydrates in the sink which ultimately increase in bunch weight. The highest yield per vine was recorded with the application of Basfoliar kelp O SL @ 3.00 ml/ liter of water (*Ecklonia maxima*) 12.11 kg/vine followed by Basfoliar kelp O SL @ 6.00 ml/ liter of water (11.48) while, lowest yield was recorded with untreated control 10.37 kg/vine. The results of the present study indicate that the increase in average bunch weight increased the total yield per vine. The results confirm the findings of Ramteke *et al.* (2005) [12] they reported that the application of bio stimulant increased the yield and improving the berry characteristics. Observations recorded on pedicel thickness was significantly influenced by the application of Basfoliar kelp O SL. These studies support the findings of who reported that the increase in yield due to the application of the ergostim which increases pedicel thickness in grapes. Similar trends were also obtained for berry length and berry diameters in this study. This result might be due the application of Basfoliar kelp O SL (*Ecklonia maxima*) which might have role auxin/cytokinin/gibberellins in grapes Panda *et al.* (2012) [9] who reported that the occurrence of plant growth regulators in sea weed extracts and seaweed concentrates.

### 3.2 Effect of Basfoliar kelp O SL (*Ecklonia maxima*) on berry quality parameters in grapes

The data recorded on the berry quality parameters were presented in Table 2. The significantly highest total soluble solids were recorded with application of Basfoliar kelp O SL (*Ecklonia maxima*) @ 3.00 ml per liter (20.05 °B) which was followed by the application of Basfoliar kelp O SL (*Ecklonia maxima*) @ 6.00 ml per liter of water (19.45°B) whereas the least total soluble solids were recorded with untreated control (16.50 °B). Contritely, the results obtained for Titratable acidity in this study. This indicates the application of Basfoliar kelp O SL (*Ecklonia maxima*) playing an important role in synthesis of sugars, organic acids and its metabolism in grapes. This confirms the findings of Ramteke *et al.* (2005) [12], who reported that the applications of bio stimulants Fantac must be helping the synthesis of sugar and metabolism of organic acids and also helps to higher total soluble solids in berries. Similarly, Kok *et al.*, 2010 [7], who reported that seaweed treatments contributed to higher quality parameters (Berry weight, berry wt. TSS, per cent acidity etc.) in grapes.

### 3.3 Correlation between yield and quality parameters in Manik Chaman grapes

The correlations between different parameters are studied present in Table No.3. Showed that positive and negative correlations between different yields and quality parameters due to use of different concentration of Basfoliar kelp O SL and Quikon. Among the all-parameters yield/ vine having highly positive relationship with yield/ acre and yield per ha. The bunch weight, berry length and berry diameter showed very strong positive relationship with each other. The Acidity was negatively correlated with TSS: Acidity ratio.

**Table 1:** Effect of Basfoliar kelp O SL on yield parameters of Manik Chaman grapes

Sr. No.	Treatment Details	Bunch Weight (g)	10 Berry Weight (g)	Pedicle Thickness (mm)	Berry length (mm)	Berry diameter (mm)	Yield/vine (kg/ vine)	Yield/ acre (ton/ acre)	Yield/ ha (ton/ ha)
T1	Basfoliar kelp O SL @ 1.5 ml/ lit	321.25	30.38	1.25	29.90	17.25	14.46	10.85	27.11
T2	Basfoliar kelp O 2.00 ml/ lit	358.80	31.95	1.30	34.03	18.93	16.15	12.11	30.27
T3	Basfoliar kelp O 6.00 ml/ lit	340.00	30.48	1.37	32.60	18.13	15.30	11.48	28.69
T4	Quikon @ 2 ml/ lit	329.98	31.08	1.38	30.50	17.50	14.85	11.14	27.85
T5	Untreated control	307.15	28.50	1.26	28.40	16.05	13.82	10.37	25.92
	SEm ( $\pm$ )	2.16	0.56	0.134	0.48	0.37	0.10	0.07	0.18
	C.D. @ .05 %	6.74	1.76	0.393	1.49	1.14	0.30	0.23	0.57

**Table 2:** Effect of Basfoliar kelp O SL on TSS, Titratable acidity & TSS / acid ratio of Manik Chaman grapes

Sr. No.	Treatment Details	TSS (Brix)	Acidity (%)	TSS/Acidity ratio
T1	Basfoliar kelp O SL @ 1.5 ml/ liter	18.48	0.78	23.69
T2	Basfoliar kelp O 2.00 ml/ liter	20.05	0.69	29.05
T3	Basfoliar kelp O 6.00 ml/ liter	19.45	0.71	27.39
T4	Quikon @ 2 ml/ liter	18.78	0.76	24.71
T5	Untreated control	307.15	28.50	28.40
	SEM ( $\pm$ )	2.16	0.56	0.48
	C.D. @ .05 %	6.74	1.76	1.49

**Table 3:** Correlation between different parameters of Manik Chaman grapes.

	Bunch Weight	10 Berry Weight	Berry Length	Berry Diameter	Yield/Vine	Yield/Acre	Yield/ha	TSS	Acidity	TSS/Acidity ratio
Bunch Weight	1									
10berryweight	0.894	1								
Berry length	0.987	0.830	1							
Berry diameter	0.987	0.920	0.979	1						
Yield/vine	1.000	0.895	0.987	0.987	1					
Yield/ acre	1.000	0.894	0.988	0.987	1.000	1				
Yield/ ha	1.000	0.894	0.987	0.987	1.000	1.000	1			
TSS	0.977	0.777	0.988	0.944	0.976	0.976	0.976	1		
Acidity	-0.957	-0.737	-0.984	-0.931	-0.956	-0.957	-0.957	-0.991	1	
TSS/Acidity ratio	0.965	0.748	0.986	0.934	0.965	0.965	0.965	0.998	-0.997	1

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