

SHORT COMMUNICATION

SCREENING OF GRAPE VARIETIES FOR THEIR DROUGHT TOLERANCE

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Fifty four grape varieties were screened, based on chlorophyll stability index (CSI) for their drought tolerance. CSI was variable from 10.44 to 85.35 %. Grape varieties like Athens, Buckland's Sweet Water, Foster Seedlings, Jose beli, Oval White, President and Queen Gold were significantly more tolerant to drought over the other varieties. Classification based on CSI (%) suggests, three as tolerant, 21 as moderate tolerant, 19 as moderate susceptible and 11 as susceptible. Thus, CSI method is more reliable to confirm the drought tolerance in grape varieties. Tolerant grape varieties have significance in arid zone viticulture to improve the grape varieties.

Key words: Chlorophyll stability index, drought tolerance, grape varieties.

In India, grape is one of the commercially important fruit crops mostly grown in semi-arid dry area with limited water resources. Water is the main factor limiting yield and quality of grapes in dry arid areas (Chadha 1984). Due to erratic rains or continuous dry spell, yield of grapes were greatly affected. It has necessitated the selection of tolerant genotypes (Patil *et al.* 1999). During and Scienza (1980) have recorded the drought resistance of some *Vitis* species and varieties. Attempt has been made in present studies to screen grape varieties for drought tolerance by evaluating their chlorophyll stability index.

Fifty four grape varieties, mostly selections of *Vitis vinifera*, *V. labrusca*, *V. champini*, *V. rotundifolia* and their inter-specific hybrids maintained at ARI (MACS) and NRC Grapes Pune have been utilized for this work. Leaf samples from 8th inter-node of each grape variety were harvested from 54 genotypes during two seasons (2001-03). The method for chlorophyll stability index was followed as suggested by Murty and Majumdar (1962).

One gram of fresh leaf sample was taken as control of unheated sample. While, one gram of fresh leaf sample was soaked in 25 ml of distilled water and then heated

at 65 °C ± 1 °C for one hour in a water bath. The extracts from unheated and heated leaves were made in 40 ml of acetone (4:1) in a mortar and pestle and filtered. Absorbance for supernatant from heated and unheated leaf samples was recorded in triplicate separately at 652 nm on U-3210 Hitachi Spectrophotometer. The difference between two readings was calculated and CSI was deduced using formula;

$$\text{C.S.I. (\%)} = \frac{\text{Unheated leaf absorbance} - \text{Heated leaf absorbance}}{\text{Unheated leaf absorbance}} \times 100$$

The mean of the two years observations were used for statistical analysis. Significance was worked out as per the standard methods (Panse and Sukhatme 1967). Out of 54 grape varieties evaluated for their drought tolerance, seven varieties have significantly high CSI. (Table 1). The varieties like Athens, Buckland's Sweet Water, Foster Seedlings, Josebeli, Oval White, President and Queen Gold were significantly superior over the other varieties. Whereas, the cultivated grape varieties like Arkavati, Bangalore Purple, Black Champa, Convent

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Table 1. Observations of leaf absorbance for chlorophyll stability index.

Grape varieties	Absorbance 652 nm		Chlorophyll Un-H	Stability Index (%)
	Unheated	Heated		
Amberqueen	2.8879	1.3133	1.5746	54.52
Anab-e-shahi	2.1908	0.9604	1.2268	56.00
Arka neelmani	3.1419	1.7939	1.3480	42.90
Arka shweta	3.7154	1.7645	1.9509	52.51
Arkavati	3.9576	2.8214	1.1362	28.71
Athens	1.3072	0.1915	1.1157	85.35**
Bianshirai	1.7142	1.0927	0.6215	36.26
Bangalore blue	2.5863	1.3778	1.2085	46.73
Bangalore purple	2.5579	2.1649	0.3930	15.36
Bhokari	2.8317	1.9390	0.8927	31.53
Black champa	0.9847	0.7674	0.2173	22.07
Black monnukka	1.6989	0.8388	0.8601	50.63
Black round	3.3340	2.0933	1.2407	37.21
Buckland's Sweet Water	2.7010	0.6881	2.0129	74.52**
Catawba	2.5681	1.4651	1.1030	42.95
Champanel	1.5178	0.7341	0.7837	51.63
Cheemasahebi	0.4759	0.2488	0.2271	47.72
Concord	1.8650	0.9540	0.9110	48.85
Convent Large Black	2.4093	1.7074	0.7019	29.13
Country Bangalore	2.0447	1.4360	0.6087	29.77
Flame Seedless	3.0314	2.5911	0.4403	14.52
Foster seedling	1.3885	0.5331	0.8554	61.61**
Goethe	1.3125	0.8743	0.4382	33.39
Gulabi	1.9596	0.9087	1.0507	53.62
H-5	3.7640	3.1148	0.6492	17.25
Hussani Black Kabuli	2.1881	0.8999	1.2882	58.87
Isabella	3.2449	1.5686	1.6763	51.66
Italian eliquina	3.3481	1.3915	1.9566	58.44
James	2.1689	1.5011	0.6678	30.79
Jawahar	3.4475	2.1962	1.2213	35.43
Josebeli	3.9201	1.2963	2.6238	66.93**
Isabella	3.2449	1.5686	1.6763	51.66

Kalisahebi	2.3245	1.2687	1.0558	45.42
Karachi	2.8032	1.7935	1.0097	36.02
Khalili	3.4107	1.9411	1.4696	43.09
Kishmish Red	3.4519	1.4296	2.0223	58.58
Kishmish raso	2.3526	2.1070	0.2456	10.44
Large white	2.4830	1.3425	1.1405	45.93
Lomint Tokay	3.6640	1.4604	2.2036	60.14
Malaga	3.6196	1.8833	1.7363	47.97
Muscat Hamburg	2.0638	1.4410	0.6228	30.18
Muscat White	2.4619	1.1807	1.2812	52.04
Oval white	3.8344	1.3971	2.4373	63.56**
Pale green	1.8409	1.2000	0.6309	34.27
Pandhari sahebi	2.5754	1.3339	1.2415	48.21
President	2.4851	0.6969	1.7882	71.96**
Queen gold	3.5147	1.3122	2.2025	62.66**
Red Prince	1.8772	0.7424	1.1348	60.45
Ribier	2.9605	1.3534	1.6071	54.28
Rubired	2.5745	1.0248	1.5497	60.19
Superior Seedless	3.5286	1.5378	1.9908	56.42
Sonaka	2.9204	2.5796	0.3408	11.67
Tas-A-Ganesh	3.2416	2.4964	0.7452	22.99
Thompson seedless	2.8375	2.0730	0.7645	26.94
Mean				44.85
C.D.				±16.94

** Significant at 5%

Large Black, Country Bangalore, Flame Seedless, H-5, Sonaka, Tas-A- Ganesh and Thompson seedless have less CSI (%).

According to Koleyoreas (1958), CSI was correlated with drought resistance in pine, it appears to be a more reliable test of drought tolerance. CSI method was adapted by Sahadevan (1961) and Murthy and Mujumdar (1962) in rice, Mathew and Ramdasan (1973) in coconut, Chhabra *et al.* (981) in mustard, Sharma and Gill (1981) in sugarcane and Patil *et al.* (1999) in grapes However, this method is more suitable to confirm the drought tolerance in grape varieties.

Based on range of CSI (%) from 10-90 % four classes were formed as 10-30, 30-50, 50-70 and 70-90. Accordingly, three varieties were classified as tolerant, 21 as moderately tolerant, 19 as moderately susceptible and eleven as susceptible (Table 2). The drought tolerant, varieties can be used in breeding programme for improvement of cultivated grape varieties (During 1986).

Table 2. Classification of grape varieties based on chlorophyll stability index.

Classes	Range	Nos.	Grape Varieties
Tolerant	70-90	3	Athens, Buckland's Sweet Water, President.
Moderate tolerant	50-70	21	Amber queen, Anab-e-shahi, Arka Shweta, Black Monnukka, Champanel, Foster seedling, Gulabi, Hussani Black Kabuli, Isabella, Italian eliquina, Josebeli, Isabella, Kishmish Red, Lomint Tokay, Muscat White, Oval White, Queen gold, Red Prince, Ribier, Rubired, Superior Seedless.
Moderate susceptible	30-50	19	Arka neelmani, Bianshirai, Bangalore blue, Bhokari, Black round, Catawba, Cheemashebi, Concord, Goethe, James, Jawahar, Kalisahebi, Karachi, Khalili, Large white, Malaga, Muscat Hamburg, Pale green, Pandharisahebi.
Susceptible	10-30	11	Arkavati, Bangalore Purple, Black champa, Convent Large Black, Country Bangalore, Flame Seedless, H-5, Kishmish raso, Sonaka, Tas-A-Ganesh, Thompson Seedless.

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