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Membrane stability index of Indian mustard (*Brassica juncea* L Czern & Coss)

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Abstract

Leaf temperature was 30.45 °C as noticed with 150 ppm SA and the highest percent decrease was 30.46 °C noticed in RGN-229 under late sowing at siliqua initiation stage. There was increase in membrane stability index with days after sowing in both genotypes under normal as well as late and very late sown it decreased with delay in sowing. Spray of SA could increase the membrane stability in both genotypes under normal, late and very late sown over control but the higher increase membrane stability index was 70.45 percent noticed with 150ppm SA in both genotypes and the highest percent increase in membrane stability index was 24.64 percent as noticed in RGN-229 under normal sown at siliqua initiation stage. Chlorophyll stability index increased with different days after sowing under three different dates of sowing in both genotypes. It decrease delay in sowing. Spray of SA could restore the chlorophyll stability in both genotypes under three dates of sowing. Higher increase in chlorophyll stability was 49.70 percent observed with 150 ppm SA in both genotypes and the percent increase in chlorophyll stability index was 32.25 percent as noticed at parenthesis stage in RGN-229 in normal sowing.

Keywords: Leaf temperature, Chlorophyll stability index, Heat susceptibility index

Introduction

High temperature stress negatively affects plant growth, development and crop yield (Boyer, 1982). According to recent study (Lobel and Asner 2003) each degree centigrade increases in average growing season temperature reduce and crop yield 17%. High temperature stress directly or indirectly affect plant photosynthetic rate by changing the structural organization and physio-chemical properties of thylakoid membrane (Lichtenthaler *et al.*, 2005). The rate of photorespiration increases with increase temperature which reduces net photosynthesis (Sage and Sharkey, 1987) and probably the seed yield of the crop.

Methodology

Membrane stability index (%)

Membrane stability index (MSI) was calculated by taking the electrical conductivity of leaf leachates in double distilled water at 40 and 100°C by following the method of Sairam (1994). Mature leaf were cut into small pieces and then taken (0.5 g) in test tubes having 10 ml. of double distilled water in two sets. One set was kept at 40°C for 30 min and another set at 100 °C in boiling water bath for 15 min and their respective electric conductivity's C1 and C2 were measured by conductivity meter (Adawa-260, Germany).
Membrane stability index (MSI) = $1 - c1/c2 \times 100$

Results and Discussion

Data (Table 1) indicates that the effect of different times of sowing was proved to be significant on membrane stability index of Indian mustard. The membrane stability index was significantly reduced with late sowing of Indian mustard than early sowing. Planting of crop on 30th November and 15th November were significantly reduced the membrane stability index by 16.66 and 5.14 percent, at flowering stage and 18.33 and 4.81 percent at siliqua initiation stage respectively, over 20th October planted crop. Further reference to data (Table 1) revealed that different cultivars of Indian mustard were also had significant effect on membrane stability index. RGN-229 cultivar recorded significantly highest membrane stability index (66.80 percent) followed by RGN-236 recorded significantly lower membrane stability index (60.80 percent).

Results in Table 1 show the response of SA on membrane stability index at different growth stages in genotype RGN-229 & 236. Treatment with SA increased membrane stability index at all the growth stages in three different date of sowing. membrane stability index with SA treatment of 50 ppm in flowering stage varied from 5.06 percent and in siliqua initiation stage from 7.57 percent; SA treatment of 100ppm in flowering stage varied from 13.41 percent and in siliqua initiation stage varied from 16.51 percent; SA treatment of 150 ppm in flowering stage varied from 21.33 percent and in siliqua initiation stage 24.64 percent but the highest rate of membrane stability index 70.45 was observed at flowering stage. Thus the maximum increase in membrane stability index with spray treatment of 150 ppm SA was 21.33 percent at flowering stage and 24.64 percent at siliqua initiation stage.

Table 1: Effect of salicylic acid to mitigate high temperature stress on cell membrane stability of Indian mustard at flowering and siliqua initiation stage

Treatments	Cell membrane stability (%)	
	Flowering stage	Siliqua initiation stage
Varieties		
RGN-236	60.80	56.38
RGN-229	66.88	63.88
S.Em.+	0.73	0.89
C.D. (P=0.05)	2.07	2.52
Date of sowing		
Normal sowing	68.84	65.16
Late sowing	65.31	62.02
Very late sowing	57.37	53.21
S.Em.+	0.97	1.09
C.D. (P=0.05)	2.53	3.08
Salicylic acid		
Control	58.06	53.60
SA 50 ppm	61.00	57.66
SA 100 ppm	65.85	62.45
SA 150 ppm	70.45	66.81
S.Em.+	1.13	1.26
C.D. (P=0.05)	2.92	3.56

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