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To evaluate performance of contrasting mustard (*Brassica juncea* L Czern & Coss) genotypes under higher temperature stress

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Abstract
Leaf temperature was 30.45 ^{0}C as noticed with 150 ppm SA and the highest per cent decrease was 30.46 ^{0}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 per cent noticed with 150ppm SA in both genotypes and the highest percent increase in membrane stability index was 24.64 per cent 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 per cent observed with 150 ppm SA in both genotypes and the percent increase in chlorophyll stability index was 32.25 per cent 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) [1]. According to recent study (Lobel and Asner 2003) [7] 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) [8]. 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
Location of experimental site
The experiment was conducted on field No. 07 at Agronomy Farm, S.K.N. College of Agriculture, Jobner. Geographically, Jobner is situated 45 km west of Jaipur at 26^0 05' North latitude, 75^0 28' East longitude and at an altitude of 427 metres above mean sea level. The area falls in agro climatic zone-IIIA (Semi-arid eastern Plain Zone) of Rajasthan.

Leaf temperature (^{0}C)
Leaf temperature was measured directly by using Infra-Red Gas Analyze (CID 301, USA).

Heat susceptibility index (HSI)
Heat susceptibility index (HSI) was the mean values of these traits under optimum and heat stress conditions were used to estimate the Heat susceptibility index and calculated by the method suggested by Fischer and Maurer (1978) with the following formula.

$$(1-YD/YP)/D$$

Where,
YD=Mean seed yield in stress.
YP= Mean seed yield in non-stress.
D= 1-(mean YD of all genotypes / mean YP of all genotypes.)

Results and Discussion

1. Leaf temperature

Data presented in table 1 showed that the effect of sowing times was found to be significant on leaf temperature. The leaf temperature of Indian mustard was progressively increased with delayed sowing. 20th October and 15th November sown crop was recorded statistically similar leaf temperature at both stages. Planting of mustard on 30th November recorded significantly higher leaf temperate, which was 3.39 and 1.58 and 4.26 and 1.81 ^{0}C higher over 20th October and 15th November planted crop, respectively, at flowering and siliqua initiation stage.

A perusal of data in table 1 further showed that the leaf temperature was also significantly differed under different varieties of Indian mustard. The significantly lower leaf temperature was recorded under variety RGN-229 then by RGN-236 which was 1.51 and 2.07 ^{0}C more at flowering and siliqua initiation stage. Results in Table 1 show the response of SA on leaf temperature at different growth stages In genotype RGN-229 & 236. Treatment with SA decreased leaf temperature at all the growth stages in three different date of sowing. Leaf temperature with SA treatment of 50 ppm in flowering stage varied from 0.60 ^{0}C and in siliqua initiation stage from 0.40 ^{0}C; SA treatment of 100 ppm in flowering stage varied from 1.30 ^{0}C and in siliqua initiation stage varied from 0.80 ^{0}C; SA treatment of 150 ppm in flowering stage varied from 1.65 ^{0}C and in siliqua initiation stage 1.30 ^{0}C but the lowest rate of leaf temperature 30.45 ^{0}C was observed at flowering stage. Thus the maximum decrease in leaf temperature with spray treatment of 150 ppm SA was 30.45 ^{0}C at flowering stage and 31.20 ^{0}C at siliqua initiation stage

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

Treatments	Leaf temperature (^{0}C)	
	Flowering stage	**Siliqua initiation stage**
Varieties		
RGN-236	31.97	32.91
RGN-229	30.46	30.84
S. Em.±	0.466	0.462
C.D. (P=0.05)	1.322	1.310
Date of sowing		
Normal sowing	29.22	29.85
Late sowing	30.80	31.66
Very late sowing	33.61	34.11
S. Em.±	0.571	0.566
C.D. (P=0.05)	1.619	1.605
Salicylic acid		
Control	32.10	32.50
SA 50 ppm	31.50	32.10
SA 100 ppm	30.80	31.70
SA 150 ppm	30.45	31.20
S. Em.±	0.660	0.654
C.D. (P=0.05)	1.870	1.853

2. Heat susceptibility index

A critical examination of data (Table 2) revealed that the heat susceptibility index of different mustard cultivars were influenced significantly by time of sowing. The significantly lowest heat susceptibility index for 30th November sown crop was recorded in RGN-236 followed by RGN-229. The mustard cultivar RGN-229 recorded significantly highest heat susceptibility index for 15th November (0.83) as well as for 30th November (0.69) planted crop. Results in the response of SA on heat susceptibility index at different growth stages In genotype RGN-229 & 236. Treatment with SA increased heat susceptibility index at all the growth stages in three different date of sowing. Heat susceptibility index with SA treatment of 50 ppm varied from 19.35 per cent increase over control was observed. SA treatment of 100ppm varied from 43.54 per cent increase over control was observed. SA treatment of 150 ppm varied from 66.12 per cent increase over control was observed, but the highest rate of heat susceptibility index 1.03 was observed. Thus the maximum increase in heat susceptibility index with spray treatment of 150 ppm SA was 66.12 per cent increase over control was observed.

Table 2: Effect of salicylic acid to mitigate high temperature stress on heat susceptibility index and oil content of Indian mustard

Treatments	Heat susceptibility index	Oil content (%)
Varieties		
RGN-236	0.76	39.30
RGN-229	0.88	41.92
S. Em.±	0.029	0.22
C.D. (P=0.05)	0.083	0.61
Date of sowing		
Normal sowing	0.94	41.60
Late sowing	0.83	40.86
Very late sowing	0.69	39.37
S. Em.±	0.036	0.26
C.D. (P=0.05)	0.101	0.75
Salicylic acid		
Control	0.62	39.24
SA 50 ppm	0.74	40.13
SA 100 ppm	0.89	41.08
SA 150 ppm	1.03	41.99
S. Em.±	0.041	0.31
C.D. (P=0.05)	0.117	0.87

References

1. Boyer A. Effect of high temperature stress negatively affects plant growth development and crop yield of mustard. Indian Journal of Agronomy. 1982; 13(2):243-190.
2. Buttar GS, Aulakh CS. Effect of sowing date, nitrogen and row spacing on growth, yield attributesand yield of Indian mustard (*Brassica juncea*). Indian J. Agron. 1999; 44(4):813-815.
3. Chandra A, Dubey A. Effect of salicylic acid on morphological and bio chemical attributes in cowpea. Journal of Environmental Biology. 2007; 28(2):193-196
4. Chandra D. Effect of agronomic practices on the performance of rapeseed (*Brassica campestris*) and Indian mustard (*Brassica juncea*) varieties in post rice season of coastal Orissa. J. Oilseeds Res. 1997; 14(2):194-201.
5. Chandrakar BL, Urkurkar JS. Performance of mustard varieties to dates of sowing in rice fallow. Ind. J. Agron. 1993; 38(1):143-144.
6. Chauhan YS, Singh D. Inheritance of seed weight in Indian mustard (Brasica juncea L.). Indian J. Genet. And Pl. Breed. 2008; 40:597.
7. Lobel GH, Asner PK. Effect of high temperature on crop growth and yield. Progress. Agriculture. 2003; 49:23-99.
8. Lichtenthaler SK. Photosynthetic response of corn and soybean to foliar application of salicylates. Indian Journal of Agricultural Sciences. 2005; 74(1):53-98.