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SALINITY TOLERANCE IN CULTIVARS *OF BRASSICA NAPUS* AND *B. COMPESTRIS* AT GERMINATION

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ABSTRACT

Six *Brassica napus* genotypes Salam, Altex, Ganyou-5, PR-7, Marnoo, NARC-82, and four genotypes of *Brassica compestris* Desi, Tobin, Torch and Span were screened for salt tolerance under glasshouse conditions at germination and seedling stages. Two levels of salinity i.e.,; 7.5 and 15 dS m^{-1} were induced in soil under test along with control (ECe 1.2 dS m^{-1}). Germination percentage was reduced significantly by the addition of salt and mean reduction in cultivars was 37 and 77 % at ECe 7.5 and 15 dS m^{-1}, respectively, as compared to control. Salam, Marnoo, Torch and Altex are sensitive while NARC-82, Desi and ganyou-5 are comparatively salt tolerant at germination and seedling stage. *Brassica napus* and B. c*ompestris)* were sensitive to salinity during germination and seedling stage. Salinity should be kept at minimum as possible.

Key words: Cultivars, *Brassica* (*napus* and *Compestris)*, seedling Growth, Germination, Salt tolerance

INTRODUCTION

It is estimated that 20% of the irrigated land in the world is presently affected by salinity (Yeo, 1999). It is estimated that the world as a whole is losing at least 3.0 hectares of fertile land every minute due to salinization / sodification (Abrol *et al*, 1988). In Pakistan, the magnitude of the problem can be gauged from the fact that the area of productive land was being damaged by salinity at a rate of about 40000 hectares annually (Alam *et al*., 2000). Green Revolution has reached its ceiling whereas the world population continues to rise. Therefore, increasing the yield of crop plants in normal soils and in less productive lands, including salinized lands, is an absolute requirement to fulfill world requirements. Salt tolerance of the crop not only varies from crop to crop but also among the varieties of the same crop. Dhawan *et. al.* (1987) reported adverse impact of saline irrigation on germination of ten varieties of Indian mustard. Kumar and Kumar (1990) reported that *Brassica* under salt stress conditions and showed that cultivars RH-7819, RH-30 and Pb-24 gave better germination than other varieties under 60 and 120 meq.l^{-1} of NaCl. Seed of oilseed rape Cv. Janpol and Lethbridge were germinated in distilled water in 100, 12.5 and 2.5 mM NaCl or $CaCl_2$ by Rizk *et al.* (1979). Germination percentage and germination rate index decreased with the increase in salt concentration. Narian *et. al.* (1979) conducted an experiment on the dry matter and seed yields of *Brassica juncea* Cv. T59. Dry matter and seed not adversely affected when irrigated with saline water of 0.6 - 12 dSm^{-1}, but were significantly decreased when irrigated with saline water of 16.0 dSm^{-1}. At present Pakistan is a major importer of edible oils. The major oil seed crops include cottonseed rapeseed / mustard, sunflower and canola etc. The total availability of edible oils in 2004-2005 was 2.764 million tons. Local production stood at 0.857 million tons which accounts for 31% of total availability while the remaining 69% was made available through imports (Anonymous, 2004-2005). Screening of Brassica cultivars for salt tolerance should help to identify the salt tolerant cultivars. Growing such cultivars on marginal land may boost up edible oil production. This study undertakes to screen the *Brassica napus* and *compestris* genotypes at germination and seedling stages.

MATERIALS AND METHODS

Study on salt tolerance in *Brassica napus* and *compestris* genotypes at germination and seedling stage was carried out in a net-house at NWFP Agricultural University, Peshawar, Six Brassica *napus* genotypes Salam, Altex, Ganyou-5, PR-7, Marnoo, NARC-82, and four *Brassica Compestris* genotypes Desi, Tobin, Torch and Span were tested at three levels of induced salinity i.e., 7.5 $\pm$ 0.04, 15 $\pm$ 0.05 along with control (1.2 dS m^{-1}). The seeds of the above cultivars were obtained from Department of Plant Breeding and Genetics, NWFP Agricultural University, Peshawar and Oil Seed Section, Agriculture Research Institute, Tarnab. Germination performance of the cultivars was tested in soil culture in round plastic trays (30 cm diameter, 5 cm depth) under net house conditions. The experiment design was split-plot complete randomized 2-factor factorial with salt concentrations at the main and

cultivars at sublevel. Salinity levels in soil were created by the addition of NaCl and $CaCl_2$. Total number of trays was twelve including eight salinized with induced salinity up to ECe of 7.5 ±0.4 and 15 ±0.5 dS.m^{-1} and four with normal soil of 1.2 dS.m^{-1} ± 0.1. Each tray was filled with 3 kg air-dried and sieved normal soil. In each tray predetermined amount of salts was added and the soils were kept under moist condition for equilibrium for one week. For sowing the soils were brought to saturation level and allowed to dry to field capacity. Ten lines at equal distance, from the center to periphery, were drawn in each tray and twenty seeds of a cultivar were sown in one line. The trays were covered to avoid evaporation. The emerged green cotyledons were considered for germination count and were recorded daily up to 16 days. After seven days of sowing, the moisture was replenished with equal water additions.

RESULTS AND DISCUSSION:

GERMINATION PERCENTAGE:

Germination and emergence rate were delayed with increasing salt concentration up to15 dS.m^{-1} of induced salinity in the soil (Table 1). Germination started on the 5th day after sowing and was completed within 16 days and the maximum germination occurred between the 7th to 9th day in the control but took longer period salinity of 7.5 and 15.0 dS. m^{-1}. The data revealed inter-varietal differences in response in *Brassica* to salinity at 7.5 dS.m^{-1}. The cultivars NARC 82 and Desi gave more than 65 %, while Marnoo, Ganyou-5 and Span more than 60% germination of their respective control. The others cultivars gave only 50% germination at 15 dS.m^{-1}. Most of *Brassica* cultivars showed more than 24% germination except Salam, PR-7, Marnoo, Altex, Torch and Span, which gave 20% germination of their respective control. The mean reduction in germination was 37 and 77% at ECe 7.5 and 15.0 dS.m^{-1}, respectively, as compared to their control. Similar results of adverse effect of salinity on germination of *Brassica* have been reported by Rizk *et. al.* (1979) and Dhawan *et. al*. (1987). Kumar, (1995) and Kumar and Kumar, (1990) have also observed in a number of crops that salinity affects the growth throughout the plants life cycle, but seed germination is at times more sensitive than the later stages of development. Soluble salts may affect seed germination by inhibiting water imbibition and/or through specific toxic effects of individual ion (Bernstein, 1975).

Table 1. Effect of Salinity on germination of cultivars of *Brassica napus* and *compestris.*
(Average of Three replicates).

Cultivars	**1.2 dS.m^{-1}** (Control)	**7.5 dS.m^{-1}**	**15 dS.m^{-1}**
	Final Germination (%)		
Salam	93.5 ± 23	58.7 ± 16	22.6 ± 3
Altex	97.5 ± 25	56.4 ± 13	21.7 ± 1
Ganyou-5	97.5 ± 25	60.2 ± 14	24.3 ± 3
PR-7	85.5 ± 21	60.7 ± 15	20.2 ± 1
Desi	93.5 ± 23	69.3 ± 18	24.0 ± 3
Marnoo	97.5 ± 25	62.8 ± 16	21.7 ± 3
NARC-82	98.5 ± 25	65.8 ± 17	25.3 ± 5
Tobin	97.5 ± 25	62.8 ± 16	25.7 ± 3
Torch	97.5 ± 25	51.2 ± 13	21.7 ± 4
Span	100.0 ± 25	60.0 ± 16	21.2 ± 3
Mean	**97.2± 24**	**61.3 ± 16**	**22.8 ± 5**

Dry matter yield:

Results shown in Table-2 reflect that NARC-82, Desi and Ganyou-5 cultivars were relatively more salt tolerant at seedling stage as compared to the other cultivars in which high salinity levels decreased their dry matter sharply. Marnoo and Salam cultivars were salt sensitive. This might happen due to inherent characteristics of a cultivar as explained by Richards (1983, 1995).

Table 2. Effect of Salinity on eight leaf dry matter yield of cultivars of *Brassica napus* and B. *compestris* (Average of Three replicates)

Genotypes	**Salinity levels dS.m^{-1}**		
	1.2 Control	**7.5 dS.m^{-1}**	**15 dS.m^{-1}**
	Eight- Leaf - Dry Matter (g)		
Salam	9.48 ± 0.63	5.40 ± 0.40	2.64 ± 0.32
Altex	10.54± 0.39	5.84 ± 0.27	3.60 ± 0.24
Ganyou-5	11.25 ± 0.26	7.79 ± 0.27	5.02 ± 0.16
PR-7	9.25 ± 0.59	6.23 ± 0.56	3.64 ± 0.37
Desi	13.88 ± 0.56	8.53 ± 0.58	5.88 ± 0.24
Marnoo	11.07 ± 0.39	4.53 ± 0.41	3.01 ± 0.14
NARC-82	14.57 ± 0.45	9.81 ± 0.66	5.95 ± 0.21
Tobin	10.11 ± 0.61	6.50 ± 0.43	4.69 ± 0.19
Torch	10.35 ± 0.38	6.36 ± 0.45	4.08 ± 0.44
Span	10.94 ± 0.68	6.53 ± 0.41	3.80 ± 0.30
Mean	**11.15 ± 0.49**	**6.75 ± 0.45**	**4.23 ± 0.26**

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