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Evaluation of Brinjal Genotypes in Salt Affected Soil Conditions of Thiruchirappalli District of Tamil Nadu

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Abstract:- Brinjal (*Solanum melongena* L., 2n=24) is one the most important vegetable crops cultivated in both tropical and sub-tropical regions of the world. Brinjal has ayurvedic medicinal properties and white brinjal is good for diabetic patients. A large indigenous biodiversity exists in eggplant with variation in plant type, stem colour, leaf size, leaf tip, midrib colour, fruit size, fruit shape, fruit colour, fruit yield, fruit quality, cooking quality, and tolerance to pests biotic abiotic stresses and there is an urgent need of information on the expression of suitability to abiotic stresses especially to problematic soils. Hence an experiment was carried out at Horticultural College and Research Institute for Women in Thiruchirapalli District of Tamil Nadu with 30 genotypes of brinjal collected from NBPGR and the Department of Vegetables, Horticultural College and Research Institute, Tamil Nadu Agricultural University. The experiment was conducted in soil with medium EC (0.35 ds/m) and moderately alkaline (pH 8.5), ESP (10.46) and CEC (17.30 cmol(p+)/kg). Average yield in an area of one hectare ranged was 38.77t and it ranged from 58.5 t/ha in SM 5 to 30.2 t/ha in SM14. Therefore, it is evident that a considerable range of variability has been observed under evaluation in problematic soil conditions and hence there a scope for developing a good pureline variety or hybrid suitable for salt affected soil conditions.

Keywords:- *Brinjal, Gentypes, Evaluation, Salt Affected Soils.*

I. INTRODUCTION

Vegetables are the main source of minerals and vitamins and are nutritionally superior, apart from containing numerous phyto-chemicals. India is an important center of diversity with a long history of domestication and adaptation of indigenous crop like brinjal and introduced germplasm of exotic origin in crops like tomato and chilli which are cultivated widely as vegetables in different agro-climatic zones. In the recent past, the yield losses due to biotic and abiotic stresses in solanaceous vegetable crops are increasing alarmingly which is significantly affecting their productivity. Breeding programmes to develop high yielding, biotic, abiotic stress tolerant/resistant and quality vegetable varieties largely depend on the availability of diverse trait-specific germplasm and crop wild relatives, which have been important source of several desirable traits and source of sterile cytoplasm and have been instrumental in developing several varieties and hybrids. Brinjal (*Solanum melongena* L., 2n=24) is one the most important vegetable crops cultivated in both tropical and sub-tropical regions of the world. World's acreage of brinjal is 1875095 lakh hectares with productivity of 26.5 tons per hectare. India produces about 5 mt of brinjal from an area of 3.2 lakh ha. The brinjal producing states are Orissa, Bihar, Karnataka, West Bengal, Andhra Pradesh, Maharashtra and Uttar Pradesh. Brinjal has ayurvedic medicinal properties and white brinjal is good for diabetic patients. It is also a source of vitamin A, C and minerals. It has wide range of variability which necessitates further programme on crop improvement. A large indigenous biodiversity exists in eggplant with variation in plant type, stem colour, leaf size, leaf tip, midrib colour, fruit size, fruit shape, fruit colour, fruit yield, fruit quality, cooking quality, and tolerance to pests biotic abiotic stresses and there is an urgent need of information on the expression of suitability to abiotic stresses especially to problematic soils. After 25 days of the salt stress, the plant growth was reduced in all cultivars, however, this decline was more pronounced in 'Adriatica' and 'Black Beauty'. When salt concentration increased, leaf Na content increased but K content and K/Na ratio decreased. The response of varieties to salt was different depending on the growth stage, and salinity tolerance of cultivars increased at the later growth stages. The physiological and molecular mechanisms of tolerance to osmotic and ionic components of salinity stress are reviewed at the cellular, organ, and whole-plant level. Plant growth responds to salinity in two phases: a rapid, osmotic phase that inhibits growth of young leaves, and a slower, ionic phase that accelerates senescence of mature leaves. Plant adaptations to salinity are of three distinct types: osmotic stress tolerance, Na(+) or Cl(-) exclusion, and the tolerance of tissue to accumulated Na(+) or Cl(-). Even though a wider array of brinjal hybrids are released by SAU's, ICAR's and private seed companies and their performance vary in many a species. The hybrids of brinjal can be well exploited for commercial vegetable production due to the advantages such as uniformity, higher yield and good cooking quality.

Brinjal is one of the important vegetable crops grown extensively in all parts of India. In Tamil Nadu, net sown area is estimated to be 56 lakh ha (43 % of total area) besides 21 lakh ha of forest area (17 % of total area). Almost 37 % of area is not being cultivated and it is either left as barren or fallow or uncultivated or not put under agricultural use etc., The major factors responsible for making the land unfit for agricultural production are land degradation and soil erosion. More than 11 % of land degradation is due to

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the deposition of Na, K, Ca, Mg and Cl salts. Salt affected soils occupying 3.68 lakh ha (Alkali soils - 3.55lakh ha, Coastal saline -0.13 lakh ha) were distributed in peninsular (96%) and coastal (4%) plains of Tamil Nadu. Besides mineral weathering, ground water also plays a role in salinization of soil. Area converted into saline due to ground water (EC > 4 dS m^{-1}) is estimated to be 3300 km^2. Agricultural production is not showing an encouraging trend and productivity is also drastically reduced in the salt affected soils due to very poor growth and yield. Amelioration and utilization of the problematic soils have been the challenging task to agriculture sector.

Chemical and mechanical methods to restore salt affected soils are generally expensive and time consuming. The best alternate approach is the cultivation of salt tolerant/resistant crops in salt affected soils. Many research works have been carried out in rice, millets, oil seeds, pulses and forest crops to study its suitability under salt affected soils. Research on horticultural crops under salt affected soils is inadequate. Though several researches conducted in brinjal at different places, resistant or tolerant varieties are not released for cultivation in salt affected soils. Since development of tolerant/ resistant varieties is the best option for cultivation in salt affected soils, purification of exiting brinjal types through selfing or production of hybrids through crossing is essential. Hence an experiment was conducted to collect and screen brinjal genotypes in salt affected soil conditions.

II. MATERIALS AND METHODS

An experiment was conducted at Horticultural College and Research Institute for Women in Thiruchirapalli District of Tamil Nadu with 30 genotypes of brinjal collected from NBPGR and the Department of Vegetables, Horticultural College and Research Institute, Tamil Nadu Agricultural University in Randomized Block Design (RBD) with three replications for screening of brinjal types for identifying the saline tolerant/ resistant brinjal to stabilize/increase the yield in salt affected soils. The experiment was conducted in soil with medium EC (0.35 ds/m) and moderately alkaline (pH 8.5), ESP (10.46) and CEC (17.30 cmol(p+)/kg). The experiment soil has sand 61.56%, silt 11.50 % and clay 23 %. The genotypes were sown in January 2018 and June 2018.

III. RESULTS AND DISCUSSION

Brinjal germplasm comprising 30 genotypes was grown in randomised block design with three replications in two seasons. The plot size was 2.5 x 2 m with inter-and intra-row spacing of 60 x 45 cm. Recommended package practices were adopted to raise healthy crop. The observations were recorded on five competitive plants for yield/plant (t/ha), fruit weight (g), fruit length (cm), fruit breadth (cm), days to first flowering, and plant height (cm) and data were analysed statistically following Panse and Sukhatme (1984). Data were observed on plant height, days to first flowering, fruit weight, fruit length, fruit breadth, fruit yield per plant and yield per hectare and the average of the two seasons were expressed in the Table 1.

Table 1. Average Performance of Brinjal Genotypes in Salt Affected Soils

Genotypes	Days to first flowering	Plant height (cm)	Fruit weight (g)	Fruit length (cm)	Fruit breadth (cm)	Fruit yield per plant (kg)	Yield (t/ha)
SM 1	58	70	120	7.0	4.5	1.2	38.0
SM 2	55	65	110	6.8	5.2	1.4	35.5
SM 3	56	66	105	6.5	5.5	1.5	32.5
SM 4	59	62	120	6.8	5.8	1.2	30.5
SM 5	50	78	210	15.5	7.5	2.2	**58.5**
SM 6	65	68	150	7.0	6.0	1.8	43.0
SM 7	52	75	185	8.5	7.8	2.3	**55.8**
SM 8	60	70	135	7.5	6.8	1.6	42.2
SM 9	72	67	140	7.2	5.5	1.8	38.5
SM 10	55	72	178	7.2	7.6	2.5	**57.5**
SM 11	65	66	155	5.6	5.4	1.5	42.5
SM 12	68	60	160	5.8	7.5	1.8	40.5
SM 13	58	58	142	5.5	6.0	2.0	35.5
SM 14	60	54	145	6.0	6.2	1.8	30.2
SM 15	62	55	100	6.5	6.6	1.2	30.5
SM 16	65	53	110	5.8	6.5	1.1	35.0
SM 17	68	52	125	5.2	7.0	1.8	38.8
SM 18	67	54	122	5.8	6.8	1.7	36.5
SM 19	70	55	120	6.0	4.8	2.0	38.5
SM 20	67	58	130	7.2	6.2	1.8	35.5
SM 21	64	60	85	7.0	5.5	1.2	32.5
SM 22	64	62	80	8.0	8.0	1.3	34.0
SM 23	65	61	90	8.2	7.0	1.5	33.5
SM 24	68	66	95	8.5	6.8	1.7	35.2

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SM 25	58	58	92	8.1	7.0	2.0	38.2
SM 26	60	56	95	5.8	7.2	1.8	40.2
SM 27	61	52	75	6.5	6.5	2.1	39.5
SM 28	64	55	78	6.8	6.4	2.0	40.5
SM 29	48	62	120	7.0	6.2	1.7	38.5
SM 30	58	65	110	6.0	5.8	1.5	35.5
Mean	61.4	61.8	122.7	7.04	6.39	1.70	38.77
CV (%)	8.5	7.5	8.8	7.5	8.2	9.5	8.5
CD at 5%	5.5	7.2	8.2	2.5	2.5	0.3	12.2
CD at 1%	8.5	9.8	12.2	3.8	3.2	0.6	16.5

The days to first flowering ranged from 48 in SM 29 to 68 in SM 12, SM17 and SM 24. The genotypes SM29, SM 5, SM7 and SM10 were found to be precocious bearer based on number of day to first flowering. The average of plant height was ranged between 52 to 78 cm with an average of 61.8 cm. Among top performing genotypes maximum and minimum value was observed in genotype SM5 (78cm) and SM 17 and also SM 27 (52 cm) respectively. Maximum fruit weight 210 g was recorded in genotype SM 5. However, minimum fruit weight 75 g was noticed in SM 27. The average value for this economic trait was 122.7 g. Average value for fruit length (cm) and breadth (cm) were 7.04cm and 6.39cm, respectively. Fruit length ranged from 15.5 cm in SM5 to 5.2 cm in SM17. Contrary to this fruit breadth ranged from 8.0 in SM 7 - 5.2 cm in SM2, exhibiting good scope for improvement in both the traits. Average yield of 1.70 kg and 38.77 t among the genotypes were observed in a plant and in an area of one hectare. Per plant yield ranged from maximum 2.5 in SM 10 to minimum 1.1 kg in SM 1 respectively. Average yield in an area of one hectare ranged was 38.77t and it ranged from 58.5 t/ha in SM 5 to 30.2 t/ha in SM14. Therefore, it is evident that a considerable range of variability has been observed for all the traits under evaluation in problematic soil conditions. The low estimates CV also suggested the presence of genetic variability along with interference on non-genetic factors. Mishra and Mishra (1990), Nandi (1992) and Dutta (1988) also reported variation in germplasm of brinjal. Prabhu *et al.* (2005) also expressed heterosis in all the growth and yield charecters of brinjal which showed that genetic variability also available in brinjal for exploiting in developing hybrids. Hence by using the variability in brinjal genotypes under salt affected soil conditions of Thiruchirappalli district of Tamil Nadu, there is a scope for developing varieties or even hybrids suitable for problematic soils for getting higher yield in brinjal. Das and Barna (2001), Dharmegowda et al. (1979), Patil *et al.* (2001) and Preneetha (2002) also developed hybrids using the variability available in the brinjal genotypes.

IV. CONCLUSION

It was concluded that based on the evaluation trials, the three genotypes expressed good yield such as SM 5, SM 7 and SM 10 can be very well utilised in further breeding and crop improvement programmes to develop a good variety or hybrid suitable for salt affected soil conditions.

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