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INFLUENCE OF SALINITY LEVELS ON SEEDLING PARAMETERS OF DIFFERENT TOMATO GENOTYPES

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Abstract

In the present study, 50 genotypes of tomatoes were tested in the roll towel method using seven levels of salt concentration from 0 to 120 mM of NaCl with an interval of 20 mM at laboratory conditions. Results showed that out of 50 genotypes, only 38 tomato genotypes germinated under a moderate salinity level of 80mM NaCl. The highest seedling fresh and dry weights were observed in LE-14 (0.271 and 0.045, respectively) under moderate salinity level which were on par with the genotypes LE-1, LE-1020, CLNR 2123, H24, IIVR88783 and LE-411. The highest fresh and dry seedling tolerance index were observed in IIVR-88783 (94.3 and 104.7) with an 80mM salinity level, which was on par with the genotypes, LE-1, LE-1020, Arka Abhay, CLNR 2123, EC 164677, EC164838, EC164863, EC326146, IIVR 88783, IIVR EC 2494, IIVREC2798, LCR 2, LE-14, Pb-Rathak, Punjab Bagkoa and Punjab Bas with a moderate salinity level of 80 mM of NaCl. The genotypes LE-14, LE-1020, LE-1, LE-411, CLNR2123, H-24, IIVR-88783 and IIVR-EC2494 were found to be superior over 38 genotypes with the seedling characters.

Introduction

Tomato (*Lycopersicon esculentum* L.) belonging to Solanaceae, is one of the most important, vegetables in India. Tomato is cultivated all over India due to its adaptability to wide range of soil and climate. Under conditions of high soil salinity, many crop plants, including tomato, are susceptible and cannot survive or can survive only with decreased yields. To alleviate the deleterious effects of salinity, the measures such as the reclamation of salinized lands, the improvement of irrigation with saline water and the cultivation of salt-tolerant variety have been applied (Tuna *et al*. 2007). As observed and considered in the context of the above factors, salt stress is applied to improve fruit quality, but little is known about the interaction between the organoleptic composition of tomato fruit and salt stress. The positive changes in tomato quality have been obtained under certain salinity treatments. The safe and efficient use of saline water for irrigation is to undertake appropriate practices to prevent the development of excessive soil salination for crop production. Many factors should be considered in making management strategies, such as crop cultivars, local climate, soil nutrients, type of salt, salinity levels, irrigation method and water management practices (Bustan *et al*. 1998, Datta *et al*. 2015). They pointed out that evapotranspiration of tomato decreased moderately with the increase of salinity, whereas the fruit yield decreased strongly. The salinity effect on root growth and senescence in tomato, conventional observations of shoot and root length are not adequate and observing root system architecture should be considered. The response of tomato to salinity is variable according to cultivars (Shannon *et al*. 1987). Several management practices can be adopted in this regard to minimize the adverse effect

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of the use of marginal water for irrigation. This effect on root growth may enhance the performance of crops grown in saline condition. Salinity also induces biochemical changes in the exposed plants such as the activity of peroxidases as a group of enzymes affected by salt stress (Sancho *et al*. 1996). The present study was aimed to evaluate the tomato genotypes with different concentrations of NaCl solutions.

Materials and Methods

The germination and seedling studies were imposed under roll towel method under laboratory condition at Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, during 2018-2019. The salt concentration levels *viz.*, T_1-0, T_2-20, T_3-40, T_4-60, T_5-80, T_6-100mM and T_7-120 mM were used in a completely randomized design with three replications. Seeds were kept under different salt concentrations and 15 days after observations data recorded for seedling parameters and the experimental were subjected for statistical analysis as suggested by Gomez and Gomez (1984).

Twenty five seeds of each treatment were placed in roll towel and the roll towels were kept in a different salt concentration medium. The number of normal seedlings, seedling shoot length, seedling root length, fresh weight and dry weight of the seedlings were recorded as replication and treatment wise on the fifteenth day of planting. The seedling dry weight were determined after drying samples at 50°C in hot air oven until a constant weight was achieved. The value of salt tolerance index (STI) was calculated as ratio of the total fresh and dry weights of plants subjected to different salt concentrations to the total fresh and dry weight of control plants (Ranjbar and Anagholi 2012, El Goumi *et al*. 2014).

Result and Discussion

Effects of salinity on the growth of seedlings grown under controlled conditions depend on several factors. They vary according to the NaCl concentration, the species, the provenance, the vegetative stage, and the part of the plant (Safdar *et al.* 2019). In the *per se* performance of seedling fresh weight in the genotype LE-14 was recorded 0.303 (T_1), 0.335 (T_2), 0.295 (T_3), 0.260 (T_4), 0.271 (T_5), 0.154 (T_6) and 0.000 (T_7) (Table1). Among the 50 genotypes of tomato, the highest seedling fresh weight was observed in LE-14 (0.271) under moderate salinity level. It was followed by LE-1020 (0.262) and LE-1 (0.251) and the lowest seedling fresh weight was observed in Pharna Bhaskor (0.012). In respect to seedling fresh weight, the combined effect of genotypes and salinity levels was evaluated to be significant. The highest seedling fresh weight (0.379) was recorded in the genotype IIVR-Pb-Khogri with 0mM salinity level and it was followed by LE-12 (0.360) and Kasamer (0.353). Whereas, the lowest seedling fresh weight was recorded in Punjab Bagkoa (0.036) with 120mM level of salinity. Nasrin and Mannan (2019), reported that the highest seedling fresh weight was found in moderate saline condition which was followed by lower concentration of salt and varietal behavior.

In the *per se* performance of seedling dry weight in the genotype LE-14 was recorded 0.045 (T_1), 0.056 (T_2), 049 (T_3), 0.043 (T_4), 0.045 (T_5), 0.026 (T_6) and 0.000 (T_7) respectively (Table 2). Among the 50 genotypes of tomato, the highest seedling dry weight (0.045) was observed in LE-14 under moderate salinity level. It was followed by LE-1020 (0.044) and LE-1 (0.042) and the lowest seedling dry weight (0.002) was observed in Pharna Bhaskor. The combined effect of genotypes and salinity levels also showed significant variation in respect of seedling dry weight. The highest seedling dry weight (0.057) was recorded in the genotype IIVR-Pb-Khogri with 0mM salinity level and it was followed by LE-1 (0.056), LE-12 (0.54) and Kasamer (0.053). This result agrees with the findings of Nasrin and Abdul Mannan (2019) who reported that the highest

Table 1. Effects of Salinity levels and fresh weight (g) of tomato genotypes.

Genotypes	T_1	T_2	T_3	T_4	T_5	T_6	T_7
Angarlata	0.235	0.230	0.235	0.193	0.106	0.123	0.045
Arka Abhay	0.174	0.215	0.175	0.167	0.123	0.083	0.000
Azota-1	0.247	0.214	0.206	0.181	0.074	0.000	0.000
CH-155	0.243	0.201	0.079	0.039	0.000	0.000	0.000
CLNR-2123	0.340	0.242	0.218	0.228	0.195	0.229	0.000
EC-163606	0.287	0.139	0.119	0.101	0.110	0.052	0.000
EC-164677	0.213	0.225	0.207	0.173	0.119	0.000	0.000
EC-164838	0.302	0.269	0.257	0.200	0.159	0.109	0.000
EC-164863	0.201	0.169	0.163	0.121	0.090	0.000	0.000
EC-165690	0.287	0.283	0.216	0.147	0.033	0.000	0.000
EC-326146	0.265	0.247	0.217	0.151	0.121	0.000	0.000
EC-567346	0.288	0.281	0.228	0.062	0.023	0.000	0.000
EC-63003	0.241	0.225	0.231	0.204	0.023	0.000	0.000
F-7-1	0.263	0.241	0.268	0.206	0.000	0.000	0.000
H-24	0.212	0.192	0.180	0.191	0.191	0.099	0.000
IIVR-1740047	0.221	0.208	0.196	0.149	0.000	0.000	0.000
IIVR-88783	0.230	0.248	0.214	0.192	0.215	0.054	0.000
IIVR-DN-2016	0.237	0.349	0.274	0.338	0.176	0.000	0.000
IIVR-EC-163894	0.197	0.178	0.137	0.124	0.030	0.000	0.000
IIVR-EC-2495	0.291	0.289	0.283	0.215	0.198	0.144	0.084
IIVR-EC-2798	0.247	0.235	0.209	0.204	0.178	0.090	0.000
IIVR-Pb-Khogri	0.327	0.379	0.204	0.165	0.155	0.073	0.136
Kasamar	0.353	0.333	0.268	0.214	0.118	0.049	0.000
Kashi	0.121	0.275	0.200	0.285	0.000	0.000	0.000
LCR-2	0.147	0.221	0.207	0.058	0.063	0.000	0.000
LE-1	0.269	0.330	0.202	0.233	0.251	0.182	0.203
LE-1020	0.342	0.311	0.301	0.287	0.262	0.143	0.111
LE-104	0.201	0.211	0.138	0.073	0.185	0.000	0.000
LE-116	0.250	0.227	0.201	0.220	0.068	0.067	0.000
LE-12	0.360	0.317	0.241	0.157	0.077	0.030	0.000
LE-14	0.335	0.303	0.295	0.260	0.271	0.154	0.000
LE-15	0.235	0.217	0.164	0.037	0.000	0.000	0.000
LE-20	0.205	0.183	0.112	0.027	0.000	0.000	0.000
LE-231	0.282	0.242	0.212	0.103	0.013	0.000	0.000
LE-355	0.270	0.243	0.222	0.147	0.056	0.000	0.000
LE-411	0.309	0.261	0.240	0.174	0.217	0.199	0.093
LE-470	0.301	0.269	0.155	0.029	0.000	0.000	0.000
LE-70	0.305	0.291	0.281	0.257	0.120	0.057	0.000
LE-828	0.158	0.146	0.200	0.095	0.000	0.000	0.000
LE-88	0.318	0.265	0.057	0.022	0.000	0.000	0.000
LE-90	0.183	0.165	0.157	0.108	0.000	0.000	0.000
P-1	0.155	0.133	0.147	0.037	0.009	0.000	0.000
Pb-Rathak	0.302	0.291	0.262	0.236	0.159	0.143	0.000
Pharna Bhaskor	0.218	0.247	0.223	0.199	0.012	0.009	0.000
PKM-1	0.280	0.296	0.251	0.171	0.024	0.013	0.000
Punjab Bagkoa	0.268	0.290	0.259	0.236	0.139	0.069	0.036
Punjab Bas	0.196	0.173	0.201	0.195	0.103	0.000	0.000
Pusatha-2	0.291	0.257	0.238	0.191	0.110	0.000	0.000
Swarna	0.163	0.173	0.236	0.195	0.103	0.000	0.000
VGR-89	0.185	0.175	0.161	0.142	0.081	0.000	0.000
Mean	0.246	0.245	0.207	0.165	0.095	0.044	0.014
SEd	0.019	0.017	0.023	0.032	0.041	0.030	0.016
CD(0.05)	0.038	0.034	0.045	0.063	0.081	0.059	0.032

Table 2. Effects of Salinity levels and dry weight (g) of tomato genotypes.

Genotypes	T_1	T_2	T_3	T_4	T_5	T_6	T_7
Angarlata	0.039	0.038	0.035	0.032	0.018	0.021	0.007
Arka Abhay	0.036	0.026	0.029	0.028	0.020	0.014	0.000
Azota-1	0.037	0.036	0.034	0.030	0.012	0.000	0.000
CH-155	0.037	0.033	0.013	0.007	0.000	0.000	0.000
CLNR-2123	0.057	0.040	0.036	0.034	0.032	0.038	0.000
EC-163606	0.043	0.023	0.020	0.017	0.018	0.009	0.000
EC-164677	0.032	0.038	0.034	0.029	0.020	0.000	0.000
EC-164838	0.045	0.045	0.043	0.033	0.027	0.018	0.000
EC-164863	0.033	0.025	0.027	0.020	0.015	0.000	0.000
EC-165690	0.048	0.042	0.036	0.024	0.005	0.000	0.000
EC-326146	0.044	0.037	0.036	0.025	0.020	0.000	0.000
EC-567346	0.048	0.042	0.038	0.010	0.004	0.000	0.000
EC-63003	0.039	0.037	0.036	0.034	0.004	0.000	0.000
F-7-1	0.036	0.044	0.045	0.034	0.000	0.000	0.000
H-24	0.032	0.032	0.030	0.032	0.032	0.016	0.000
IIVR-1740047	0.031	0.037	0.033	0.025	0.000	0.000	0.000
IIVR-88783	0.035	0.041	0.036	0.032	0.036	0.009	0.000
IIVR-DN-2016	0.036	0.058	0.046	0.056	0.029	0.000	0.000
IIVR-EC-163894	0.030	0.030	0.023	0.021	0.005	0.000	0.000
IIVR-EC-2495	0.048	0.044	0.047	0.036	0.033	0.024	0.014
IIVR-EC-2798	0.037	0.039	0.035	0.034	0.030	0.015	0.000
IIVR-Pb-Khogri	0.057	0.055	0.034	0.027	0.026	0.012	0.023
Kasamar	0.055	0.053	0.045	0.036	0.020	0.008	0.000
Kashi	0.018	0.046	0.033	0.047	0.000	0.000	0.000
LCR-2	0.022	0.037	0.035	0.010	0.011	0.000	0.000
LE-1	0.056	0.055	0.034	0.039	0.042	0.030	0.034
LE-1020	0.057	0.047	0.050	0.048	0.044	0.024	0.019
LE-104	0.035	0.030	0.023	0.012	0.031	0.000	0.000
LE-116	0.042	0.034	0.033	0.037	0.011	0.011	0.000
LE-12	0.054	0.053	0.040	0.026	0.013	0.005	0.000
LE-14	0.056	0.045	0.049	0.043	0.045	0.026	0.000
LE-15	0.035	0.036	0.027	0.006	0.000	0.000	0.000
LE-20	0.031	0.031	0.019	0.004	0.000	0.000	0.000
LE-231	0.042	0.040	0.035	0.017	0.002	0.000	0.000
LE-355	0.041	0.040	0.037	0.025	0.009	0.000	0.000
LE-411	0.046	0.043	0.040	0.029	0.036	0.033	0.016
LE-470	0.045	0.045	0.026	0.005	0.000	0.000	0.000
LE-70	0.049	0.046	0.047	0.043	0.020	0.010	0.000
LE-828	0.024	0.024	0.033	0.016	0.000	0.000	0.000
LE-88	0.048	0.044	0.009	0.004	0.000	0.000	0.000
LE-90	0.028	0.028	0.026	0.018	0.000	0.000	0.000
P-1	0.023	0.022	0.025	0.006	0.001	0.000	0.000
Pb-Rathak	0.045	0.048	0.044	0.039	0.027	0.024	0.000
Pharna Bhaskor	0.033	0.041	0.037	0.033	0.002	0.001	0.000
PKM-1	0.049	0.042	0.042	0.029	0.004	0.002	0.000
Punjab Bagkoa	0.048	0.040	0.043	0.039	0.023	0.012	0.006
Punjab Bas	0.029	0.029	0.033	0.033	0.017	0.000	0.000
Pusatha-2	0.044	0.043	0.040	0.032	0.018	0.000	0.000
Swarna	0.025	0.029	0.039	0.033	0.017	0.000	0.000
VGR-89	0.028	0.029	0.027	0.024	0.013	0.000	0.000
Mean	0.037	0.041	0.035	0.028	0.016	0.007	0.002
SEd	0.004	0.003	0.004	0.005	0.007	0.005	0.003
CD(0.05)	0.008	0.006	0.008	0.011	0.014	0.010	0.005

seedling dry weight was found in moderate saline condition followed by lower concentration of salt. Whereas, the lowest seedling dry weight was recorded in Punjab Bagkoa (0.006) in 120mM level of salinity. Effects of salinity are mainly manifested by a slower vegetative growth. The reduction in shoot and root growth by salt stress can be a consequence of unbalanced nutrient uptake by the seedlings; and the inhibition of shoot and root elongation is due to diminished water and essential mineral uptake by plants. In general, salt stress inhibits the growth of shoots more than roots. Mahdavi and Sanavy (2007) observed significant differences among grass pea cultivars under salt stress in terms of coleoptile and root growth, indicating that genetic variation exists within the cultivars and that salt inhibited coleoptile growth more than root growth.

A significant difference was observed among seven cultivars. The STI was based on the final germination percentage reflecting the effect of salt stress from the beginning to the end of the experiment. This criterion was used by Kpinkoun *et al.* (2018) to classify chili pepper cultivars according to their salt resistance level. In the present investigation, the result showed that the per se performance of fresh seedling tolerance index in the genotype IIVR-88783 was recorded 0.0 (T_1), 108.3 (T_2), 93.4 (T_3), 83.6 (T_4), 94.3 (T_5), 24.5 (T_6) and 0.000 (T_7), respectively (Table 3). Among the 38 genotypes of tomato, the highest fresh seedling tolerance index was observed in IIVR-88783 (94.3) under moderate salinity level followed by LE-1 (92.5) and LE-104 (92.3) and the lowest fresh seedling tolerance index was observed in LE-231 (4.8). The combined effect of genotypes and salinity levels also showed significant variation in respect to fresh seedling tolerance index. The highest fresh seedling tolerance index (234.6) was recorded in the genotype of Kasi with 60mM salinity level followed by 226.2 (20 mM) and 165.5 (40mM). Whereas, the lowest fresh seedling tolerance index was recorded in Punjab Bagkoa (13.2) in 120 mM level of salinity.

In the per se performance of dry seedling tolerance index in the genotype IIVR-88783 (G21) was recorded 0.0 (T_1), 120.3 (T_2), 103.8 (T_3), 92.93 (T_4), 104.75 (T_5), 27.27 (T_6) and 0.000 (T_7), respectively (Table 4). Among the 50 genotypes of tomato, the highest dry seedling tolerance index was observed IIVR-88783 (104.75) under moderate salinity level. It was followed by LE-104 (102.53) and H-24 (101.64) and the lowest dry seedling tolerance index was observed in LE-231 (5.28). The combined effect of genotypes and salinity levels also showed significant variation in relation to dry seedling tolerance index. The highest dry seedling tolerance index (251.3) was recorded in the genotype Kasi with 20 mM salinity level and it was followed by 183.9 (40mM), 260.67 (60mM). Whereas, the lowest dry seedling tolerance index was recorded in Punjab Bagkoa (14.63) under 120mM level of salinity. A study of the salt tolerance of ten native and six exotic potato genotypes in Bangladesh measured stress tolerance trait indices (STTIs) in four groups-tolerant, moderately tolerant, sensitive, and very sensitive-and the data were useful for improving potato yield. Difference among species and cultivars for salinity tolerance may depend on their differences in salinity tolerance mechanism. Exploitation of these useful genetic variations in salinity tolerance particularly of crop plants is an economical approach for proper utilization of salt- affected agricultural lands. Thus, more research for salt tolerance in these cultivars would involve screening a larger range of germplasm. Hence these genotypes can be further utilized for salinity screening at pot cultures and expperiment.

To develop salt-tolerant varieties, it is essential to create an effective screening method that allows exact identification of salt tolerance parameters useful for breeding programme. Germination and the early growth stages would be the most sensitive phases that are affected by salinity. The varieties tolerating salinity stress at the germination usually continue resistance in later stages, but sprouting is not sufficient to identify salt stress-tolerant genotypes. Further studies at later stages, such as the reproductive phase, and assessment of their performance under field conditions are needed to evaluate the effect of salt stress on yield.

Table 3. Effects of Salinity levels and fresh seedling tolerance index (%) of tomato genotypes.

Genotypes	T_1	T_2	T_3	T_4	T_5	T_6	T_7
Angarlata	0	101.9	98.7	81.4	46.3	53.3	19.3
Arka Abhay	0	124.6	100.6	95.5	70.6	49.5	0.0
Azota-1	0	86.8	83.5	73.6	29.4	0.0	0.0
CH-155	0	82.8	33.0	16.8	0.0	0.0	0.0
CLNR-2123	0	150.0	97.4	105.9	86.5	101.1	0.0
EC-163606	0	48.9	43.4	36.8	40.0	20.8	0.0
EC-164677	0	105.8	97.1	81.5	55.8	0.0	0.0
EC-164838	0	89.4	85.4	66.4	52.9	36.4	0.0
EC-164863	0	133.4	106.5	95.2	78.9	0.0	0.0
EC-165690	0	101.7	76.6	52.1	11.4	0.0	0.0
EC-326146	0	107.4	88.2	61.4	49.2	0.0	0.0
EC-567346	0	102.4	81.0	22.3	8.2	0.0	0.0
EC-63003	0	93.3	96.0	84.7	10.2	0.0	0.0
F-7-1	0	108.9	111.0	85.4	0.0	0.0	0.0
H-24	0	91.2	85.5	91.2	91.5	44.3	0.0
IIVR-1740047	0	106.4	94.4	71.9	0.0	0.0	0.0
IIVR-88783	0	108.3	93.4	83.6	94.3	24.5	0.0
IIVR-DN-2016	0	149.0	117.4	146.0	80.4	0.0	0.0
IIVR-EC-163894	0	89.6	69.7	63.2	15.9	0.0	0.0
IIVR-EC-2495	0	99.3	97.3	73.7	68.0	49.2	29.0
IIVR-EC-2798	0	95.0	85.1	83.5	75.1	38.8	0.0
IIVR-Pb-Khogri	0	86.5	53.8	43.5	40.7	19.2	35.9
Kasamar	0	94.5	76.2	61.2	34.0	14.4	0.0
Kashi	0	226.2	165.5	234.6	0.0	0.0	0.0
LCR-2	0	154.9	143.0	44.6	48.7	0.0	0.0
LE-1	0	126.0	75.0	89.3	92.5	68.0	77.1
LE-1020	0	109.9	97.0	92.3	84.5	45.6	35.8
LE-104	0	105.0	69.1	38.0	92.3	0.0	0.0
LE-116	0	113.0	92.0	99.7	39.5	38.8	0.0
LE-12	0	88.2	67.0	43.5	21.3	8.5	0.0
LE-14	0	112.1	100.8	87.4	91.3	52.0	0.0
LE-15	0	92.2	69.7	16.2	0.0	0.0	0.0
LE-20	0	92.0	56.0	11.5	0.0	0.0	0.0
LE-231	0	85.8	75.1	36.3	4.8	0.0	0.0
LE-355	0	90.1	82.6	54.9	21.4	0.0	0.0
LE-411	0	84.2	77.7	56.3	70.2	64.4	30.3
LE-470	0	89.2	51.3	9.1	0.0	0.0	0.0
LE-70	0	95.8	92.9	84.6	40.9	19.5	0.0
LE-828	0	92.8	128.3	58.7	0.0	0.0	0.0
LE-88	0	83.1	17.3	6.7	0.0	0.0	0.0
LE-90	0	90.7	86.5	59.3	0.0	0.0	0.0
P-1	0	86.4	96.1	25.0	5.9	0.0	0.0
Pb-Rathak	0	96.4	86.8	78.1	52.8	47.7	0.0
Pharna Bhaskor	0	113.6	102.8	91.5	5.8	4.2	0.0
PKM-1	0	105.6	89.5	61.3	8.7	4.8	0.0
Punjab Bagkoa	0	108.6	96.7	88.0	51.8	25.7	13.2
Punjab Bas	0	89.1	104.3	101.0	58.1	0.0	0.0
Pusatha-2	0	88.9	82.2	66.1	38.1	0.0	0.0
Swarna	0	106.6	145.2	120.1	62.4	0.0	0.0
VGR-89	0	94.9	87.3	77.2	44.3	0.0	0.0
Mean	0	102.7	88.2	71.1	39.5	16.6	4.8
SEd	0	12.6	10.9	17.6	24.1	13.3	6.2
CD(0.05)	0	24.9	21.7	35.0	47.8	26.3	12.2

Table 4. Effects of Salinity levels and dry seedling tolerance index (%) of tomato genotypes.

Genotypes	T_1	T_2	T_3	T_4	T_5	T_6	T_7
Angarlata	0	113.2	109.7	90.48	51.45	59.23	21.48
Arka Abhay	0	138.5	111.7	106.11	78.43	54.95	0.00
Azota-1	0	96.4	92.8	81.78	32.72	0.00	0.00
CH-155	0	92.0	36.7	18.65	0.00	0.00	0.00
CLNR-2123	0	117.7	108.2	166.72	96.12	112.33	0.00
EC-163606	0	54.33	48.2	40.86	44.44	23.11	0.00
EC-164677	0	117.6	107.9	90.55	61.94	0.00	0.00
EC-164838	0	99.3	94.9	73.74	58.83	40.45	0.00
EC-164863	0	148.3	118.3	105.83	87.72	0.00	0.00
EC-165690	0	113.0	85.1	57.90	12.69	0.00	0.00
EC-326146	0	119.3	98.0	68.24	54.72	0.00	0.00
EC-567346	0	113.8	90.03	24.78	9.06	0.00	0.00
EC-63003	0	103.6	106.7	94.09	11.37	0.00	0.00
F-7-1	0	121.0	123.4	94.89	0.00	0.00	0.00
H-24	0	101.4	95.0	101.28	101.64	49.19	0.00
IIVR-1740047	0	118.2	104.9	79.89	0.00	0.00	0.00
IIVR-88783	0	120.3	103.8	92.93	104.75	27.27	0.00
IIVR-DN-2016	0	165.5	130.5	162.25	89.38	0.00	0.00
IIVR-EC-163894	0	99.5	77.5	70.27	17.65	0.00	0.00
IIVR-EC-2495	0	110.3	108.1	81.90	75.60	54.70	32.20
IIVR-EC-2798	0	105.6	94.6	92.79	83.45	43.10	0.00
IIVR-Pb-Khogri	0	96.1	59.8	48.37	45.21	21.37	39.89
Kasamar	0	105.0	84.6	67.97	37.76	15.98	0.00
Kashi	0	251.3	183.9	260.67	0.00	0.00	0.00
LCR-2	0	172.1	158.9	49.57	54.13	0.00	0.00
LE-1	0	114.3	69.7	82.27	86.47	59.43	76.76
LE-1020	0	122.1	107.8	102.60	93.88	50.68	39.73
LE-104	0	116.7	76.8	42.17	102.53	0.00	0.00
LE-116	0	125.6	102.2	110.78	43.93	43.07	0.00
LE-12	0	98.0	74.5	48.28	23.71	9.45	0.00
LE-14	0	124.6	112.0	97.14	101.46	57.82	0.00
LE-15	0	102.5	77.5	17.98	0.00	0.00	0.00
LE-20	0	102.2	62.23	12.77	0.00	0.00	0.00
LE-231	0	95.4	83.5	40.37	5.28	0.00	0.00
LE-355	0	100.1	91.8	60.96	23.74	0.00	0.00
LE-411	0	93.6	86.4	62.51	77.97	71.61	33.61
LE-470	0	99.1	57.0	10.14	0.00	0.00	0.00
LE-70	0	106.4	103.2	94.02	45.41	21.66	0.00
LE-828	0	103.2	142.6	65.23	0.00	0.00	0.00
LE-88	0	92.4	19.2	7.45	0.00	0.00	0.00
LE-90	0	100.8	96.1	65.94	0.00	0.00	0.00
P-1	0	95.96	106.7	27.75	6.59	0.00	0.00
Pb-Rathak	0	107.1	96.4	86.81	58.61	52.95	0.00
Pharna Bhaskor	0	126.2	114.2	101.71	6.47	4.67	0.00
PKM-1	0	117.4	99.5	68.11	9.66	5.37	0.00
Punjab Bagkoa	0	120.6	107.5	97.83	57.53	28.58	14.63
Punjab Bas	0	99.0	115.9	112.21	64.56	0.00	0.00
Pusatha-2	0	98.8	91.3	73.45	42.33	0.00	0.00
Swarna	0	118.5	161.3	133.44	69.35	0.00	0.00
VGR-89	0	105.5	97.0	85.80	49.18	0.00	0.00
Mean	0	113.59	97.71	78.61	43.56	18.14	5.17
SEd	0	14.98	12.80	20.13	27.33	14.95	7.97
CD(0.05)	0	29.73	25.41	39.95	54.23	29.66	15.81

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