J. Appl. Hort., 3(2):117-118, July-December, 2001

Short Note

Screening of tomato germplasm for some physiological disorders

T. Rama Srinivas

National Bureau of Plant Genetic Resources, Regional Station, Hyderabad-500 030, India

Abstract

One hundred and eighty tomato accessions were evaluated under semi-arid clinmatic conditions for physiological disorders *viz.,* cracking, Green back, fruit fasciation and puffiness. A high proportion of accession showed radial (34.44%) and concentric (25.56%) cracks. Percentage of accessions exhibiting both radial and concentric craking was 13.33% whereas fruit fasciculation was recorded in 6.66% accessions. The percentage of puffy fruits was very low (56%).

Key words: Physiological disorder, cracking, green back, fasciation, puffiness, accessions.

India is a dominant vegetarian country and the world's largest producer of vegetable but its current annual production is far short of the required production level of about 100 m.t to meet the nutritional demand of the population. The country's vegetable production requirement is projected to rise to 150 m.t by the year 2010. The current production of 71 m.t is only sufficient to provide a per capita availability of 210 g of vegetables a day as against the balanced diet requirement of 250g. Experts say that there is a scope for increasing the tomato yield in the country six to seven times. The key to yield success is to obtain a good fruit per cluster and to ripen the fruit as quickly as possible. The loss of one or two fruit per cluster or a missing cluster will significantly reduce yield. Genetic traits, environmental conditions and cultural practices predispose plants to unfruitfulness, physiological disorders and fruit defects are also significant limitations to productivity (Jones, 1980). During the past few years tomato growers have become increasingly concerned with intensity of these disorders. The control of disorders is essential for profitable production of the crop (Kalloo, 1986). Physiological disorders covered in this paper have a characteristic set of symptoms whose origin can not be attributed solely to a biological agent or to a single environmental component.

The material used for the study comprised of 180 tomato exotic accessions along with local checks in an augmented block design during 1997-98 at NBPGR Regional Station, Rajendranagar, Hyderabad. The climate is semi-arid with a range of 3.5-283.4 mm rainfall. The minimum and maximum temperature range was 10.1-26^{o}C and 28.2-39^{o}C, respectively. The soil type is of red sandy loams. A month old seedlings were transplanted at a distance of 60 x 60 cm spacing. Recommended cultural practices such as application of manure and fertilizers, weeding and irrigation were followed during the cropping season. Each germplasm accession was planted in three rows of 3m each. Three plants per accession were tagged and data was recorded at full maturity stage as per IPGRI, 1996 descriptor. Cracks of varying size and depth that occured in circles around the stem scar are called as concentric cracking and radial from the stem scar are called as radial cracking. Presence of green shoulders on mature and ripening fruit is called green strips. Adherence of two fruits with each other is called fruit fasciation and partially filled fruits are called puffiness.

Cracking of surface of the fruit at the stem end is a common occurrence and often results in large losses. Radial cracking is more damaging than concentric cracking. About 34.44% and 25.56% of accessions have shown radial and concentric cracks, respectivley. Accessions (13.33%) have shown both radial and concentric craking (Table 1).

Table 1. Accessions susceptible to physiological disorders

Disorder	Accessions
Cracking	EC 145622, EC 157568, EC 162604, EC 164333, EC 164334, EC 164563, EC 164625, EC 164656, EC 164838, EC 164844, EC 164863, EC 165749, EC 168281, EC 168283, EC 173853, EC 176933, EC 177339, EC 196045, EC 241140, EC 272995, EC 313477, EC 315457, EC 315478, EC 315480
Green back	EC 163599, EC 164607, EC 163585, EC 177325, EC 251709, EC 272496
Fruit fasciation	EC 145615, EC 151568, EC 162601, EC 163605, EC 163673, EC 164333, EC 164670, EC 177393, EC 238508, EC 272995, EC 320569, EC 338717
Puffiness	EC 163594

The locule number of the cracked fruits varied from 2-6 and 2-11 in case of radial and concentric cracking fruits respectively with small to intermediate fruit size. Kinet and Peet (1997) reported that cracking problems are most often seen in large, multilocular cultivars in USA. It has been difficult to breed for cracking resistance *per se* (Stevens and Rick, 1986). Commercial varieties bred for firm fruit and tough skin in order to decrease handling and shipping losses in field tomato production are often quite resistant to fruit cracking. Fruit not shaded by foliage, high light conditions, fluctuations in water supply are responsible for fruit cracking in tomato. Harvesting before the pink stage of ripeness,

maintaining vegetative cover to shade the fruit offer the best protection against cracking besides soil and foliar application of borax.

Green back, also called persistent green shoulder or yellow shoulder is considered a ripening disorder (Hobson *et al.* 1977), but primarily affects fruits from genotypes lacking the uniform ripening gene (Picha, 1987). Like the ripening disorder, however, composition of affected tissue differs (Hobson *et al.* 1977). Environmental and nutritional factors have been correlated with disorder incidence. But it is difficult to completely control the disorder by controlling above causes. The best control is undoubtedly to choose cultivars with the uniform ripening gene (Kinet and Peet, 1997). About 3.33% accessions possessed green trips on the fruit (Table 1).

Fruit fasciation is the another disorder recorded in the present investigation. About 6.66% of accessions (Table 1) of tomato germplasm has shown this disorder, which is also environmental dependent.

Accession EC 163594 (0.56%) possessed puffiness (partially filled in between locular cavity and pericarp). This may be due to non fertilization of ovule, embryo abortion after normal fertilization and necrosis of vascular and placental tissue after the fruit is well developed. The causal factors are high or low temperature and soil moisture. The puffy fruits are light in weight, lack firmness also.

For many physiological disorders, little in-depth research has been done and the causes are poorly understood both in terms of why cultivars differ in susceptibility and why certain environments or cultural practices predispose plants to the disorder. As it is difficult to completely control these disorders by controlling environmental and nutritional factors, the best way is to select accession resistant to these disorders besides harvesting the fruit at right stage of maturity and maintenance of vegetative cover to shade the fruits to increase per capita availability of vegetables.

Acknowledgements

The author is grateful to Dr. P.L. Gautam, Director, NBPGR, New Delhi, Dr. S.K. Mittal, Head, Germplasm Evaluation Division, NBPGR, New Delhi and Dr. K.S. Varaprasad, Officer In Charge, NBPGR Regional Station, Hyderabad for providing material for the present study.

References

Hobson, G.E., J.N. Davies and G.W. Winsor, 1977. Ripening disorders of tomato fruit Grower's Bulletin No.4. Glasshouse crops research institute. Littlehampton, England.

Jones, J.B. 1980. Green house vegetable yields: How high can you go? *American Vegetable Grower,* 28:24-26.

Kalloo, G. 1986. *Tomato* (*Lycopersicon esculentum* Miller). Allied Publishers Private limited, PP 326-344.

Kinet, J.M and M.M. Peet, 1997. Tomato. *In*: The physiology of vegetable crops H.C. Wien ed), CAB Internaitonal. pp. 207-258.

Picha, D.H. 1987. Physiological factors associated with yellow shoulder expression in tomato fruit. *J. Am. Soc. Hort. Sci.*, 112:798-801.

Stevens, M.A. and C.M. Rick, 1986. Genetics and breeding. *In*: The tomato crop- A scientific basis for improvement. Atherton, J.G. and Rudich, J. (eds). Chapman and Hall, London, pp. 35-109.