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Root Seedling Morphology Diversity in *Capsicum* spp.

Elena PELÁEZ-ANDERICA, Adrián RODRÍGUEZ-BURRUEZO, Jaime PROHENS, Ana FITA

Instituto de Conservación y Mejora de la Agrodiversidad Valenciana, Universitat Politècnica de València, Camino de Vera 14, 46022, Valencia, Spain; anfifer@btc.upv.es

SUMMARY

Roots are responsible, among others, of water and mineral uptake from the soil. Breeding varieties for improved root traits would be useful to develop new varieties resistant to drought and other stresses. However, the studies on root traits are scarce. Common peppers (*Capsicum annuum* L.) and other cultivated *Capsicum* species (*C. frutescens, C. baccatum* and *C. pubescens*) are important commercial crops and display a great genetic diversity (Bosland and Votava, 1996). Despite their agricultural and biological importance, knowledge and information about pepper roots genetics has been very limited till now. Kulkarni and Phalke (2009) studied the root size of twelve hot pepper cultivars and their adaptation to drought. They found genetic diversity for root size traits and a correlation to drought resistance. In this research, we compare the morphological differences in roots of 17 *Capsicum* cultivars including commercial, traditional and wild varieties (Tab. 1).

Tab. 1

Capsicum cultivars used in the study

Code	Common name	Origin	Species
Num	Numex	USA	*C. annuum*
Ja-1	Jalapa F1	Mexico	*C. annuum*
Ja-2	Jalapeno Espinalteco	Mexico	*C. annuum*
Ja-3	Jalapeno Candelaria	Mexico	*C. annuum*
Pa	Pasilla	Mexico	*C. annuum*
Chi	Chile de árbol	Mexico	*C. annuum*
Ser	Serrano	Mexico	*C. annuum*
Cri	Serrano Criollo de Morelos	Mexico	*C. annuum*
Bol	Bola	Spain (Murcia)	*C. annuum*
Guin	Guindilla	Spain (Valencia)	*C. annuum*
Pi	Piquillo	Spain (Navarra)	*C. annuum*
Ca	California wonder	Spain (Valencia)	*C. annuum*
Fru	C. frutescens	Bolivia	*C. frutescens*
Bac-1	C. baccatum-1	Bolivia	*C. baccatum*
Bac-2	C. baccatum-1	Bolivia	*C. baccatum*
Pub-1	C. pubescens	Bolivia	*C. pubescens*
Pub-2	C. pubescens	Bolivia	*C. pubescens*

Five seeds of each cultivar were surface sterilized and germinated in Petri dishes. Seedlings with rootlets of two centimetres in length were transferred to a vertical blotter paper growing system as described in Fita *et al*. (2011) with Epstein nutrient solution at ¼ strength. After 12 days, a scanned image of the roots was taken and the plants were transferred to the glasshouse for further growth and analysis not included in this study. Root images were

analyzed with WinRhizo Pro software. The following measures were taken: i) root length (RL, cm), ii) root diameter (mm) and iii) number of lateral roots (NL). This experiment was repeated twice; therefore the results showed are the average of ten plants.

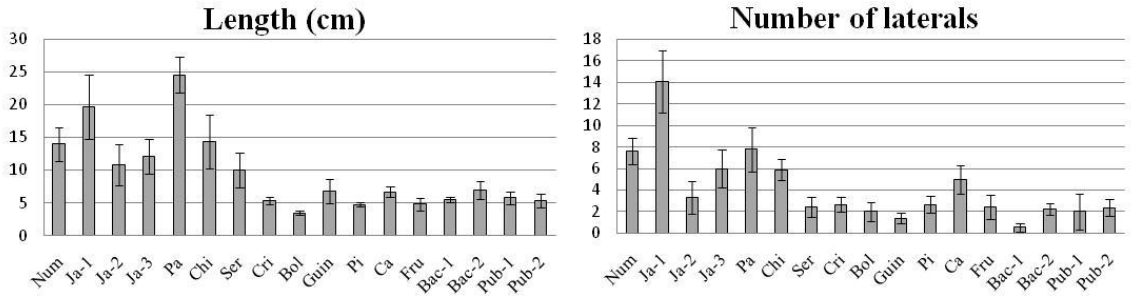

Fig. 1. Mean values of root length and number of lateral roots of the seventeen *Capsicum* cultivars studied at 12 d after germination. Bars represent ±SE

Despite the fact that the study was done at seedling state, we found significant differences for RL and NL among the studied cultivars (Fig. 1). Among *C. annuum* cultivars, those original from Mexico and USA showed greater values (except for Serranos) than the Spanish cultivars, indicating a quick establishment of the plant after germination. It is not surprising that the greater value for both parameters was obtained in Jalapa, a commercial F1 hybrid, which must carry the alleles of drought adapted Jalapeno varieties and in addition a likely heterosis for root growth resulting from hybrid vigour. Pasilla cultivar also outstood by its RL but it had intermediate NL. All the *C. frutescens*, *C. baccatum*, *C. pubescens* cultivars showed poor root development, indicating their slow growth at the initial stages of plant development. Regarding the average diameter, it was less variable than the other parameters ranging from 0.48 mm to 0.75 mm. This is the first time that the root system of these cultivars has been analyzed. At the moment we are studying the performance of the roots of these cultivars at adult state (70 days). The great root diversity displayed suggests that some of these cultivars can be used for root system breeding in pepper.

Keywords: Pepper, root architecture, root length, drought resistance

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