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Identification of fertility restorer and sterility maintainer lines in chilli (Capsicum annuum L.)¹

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Abstract

Three cytoplasmic geneic male sterile lines of chilli (*Capsicum annuum* L.) namely, JNKVVA1, ACBGA1 and ACBGA2 showed 100% male sterility when tested with 1% acetocarmine solution. Among the 50 chilli lines crossed with the three male sterile lines, 36 lines were stable for fertility restoration (Rf) while, two lines namely, AVNPC131 and X235 were identified as sterility maintainers (rf).

Keywords: chilli hybridization, inbred segregation, stable restorers, sterility maintainers

The process of emasculation and pollination in chilli (*Capsicum annuum* L.) for hybrid seed production is a cumbersome practice. Utilization of a stable commercial viable male sterility source in chilli would help in making the hybridization process easy and economically viable. In the present study, three cytoplasmic male sterile lines were evaluated to identify stable male sterile lines.

Three cytoplasmic genetic male sterile lines namely, JNKVVA1, ACBGA1 and ACBGA2 were grown in a shade house from 15th August 2008 to 30th June 2009 at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (Madhya

Pradesh). ACBGA1 and ACBGA2 were obtained from University of Agricultural Sciences, Dharwad and JNKVVA1 from Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur. On the basis of pollen dehiscence the plants were classified as male fertile or male sterile. The number of stained pollen grains was evaluated by microscopic examination (Gulyas *et al.* 2006). Cytoplasmic male sterility is important in many crops for F₁ hybrid seed production as well as for research on nuclear mitochondrial interaction (Chase 2007). Fifty chilli lines were crossed with each of the three male sterile lines to produce 150 F₁ hybrids

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during kharif 2008 and sown in shade house as well as in the field. Based on their fertility restoration, inbred plants were classified into three categories: (i) stable for fertility restoration (Rf) (ii) stable for sterility maintainer (rf) and (iii) inbred plants still segregating (Rf/rf) (Kumar *et al.* 2007).

Out of the 150 F₁ fertility was restored in 117, partially restored in 21 and sterility was maintained in 12 when tested during summer 2009 in shade house conditions in pots (Table 1). Under shade house during kharif 2009, fertility was restored in 109, partially restored in 30 and sterility maintained in 11 (Table 1). However, under field conditions, fertility was restored in 116, partially restored in 24 and sterility maintained in 10 hybrids (Table 1). Variations were observed for the presence of fertility restorer gene Rf in the genotypes used as male on CMS lines.

Table 1. Fertility restorer, sterility maintainer and segregating lines under shade house and field condition in chilli

Total hybrids	Fertility restorer	Partial restorer	Sterility maintainer							
Net house										
150	117	21	12							
Shade house										
150	109	30	11							
Field										
150	116	24	10							

The stable restorers (lines which restore fertility after crossing with all three sterile lines) as well as sterility maintainer lines (lines which restore sterility after crossing with all three sterile lines) are presented in Table 2. Among the 50 lines, 36 lines, namely, Shankeswar, JM-218, Pant C-1, G-4, K1-4, 9608U, BVC-1, GUK-1, GUK-2, GUK-2-1, GUK-2-1-1, IC119578, IC119561, LCA-235, LCA-304, LCA-310, LCA-310A, LCA-334, LCA-960, KDC-1, GPC-82, D. DABBI, KDSC210-10-3, KDSC210-10-4, KDSC210-10, SUM05-2R, P. JWALA, KA-2, K1-4 D, HMT-1,

B. Kaddi, Jayanti, GCV111, GCV131, P. Sadabahar and BVC-37, were stable for fertility restoration (Rf) while, two lines namely, AVNPC131 and X235 were identified as sterility maintainers (rf) whereas, remaining 12 lines namely, Phule Jyoti, Hisar Vijay, H0413, IC119243, IC112109, KDSC210-10-1. KDSC210-10-2, KDSC510-10-1, KDSC510-10-2, KDSC510-10, HCS-3 and JM-283 were found segregating (Rf/rf). Fertility restoration analysis revealed presence of fertility restoration gene Rf in majority of the lines. Similar findings have also been reported earlier in chilli by testing different lines (Kumar *et al.* 2004; Singh *et al.* 2006).

It could be concluded from the study that all the three male sterile lines were stable for cytoplasmic male sterility over different seasons at Jabalpur. Fertility restoration analysis revealed the presence of fertility restoration and sterility maintainer gene in thirty six and two lines respectively. Majority of the lines exhibited fertility restoration gene (Rf) whereas, only two lines namely, AVNPC131 and X235 exhibited sterility maintainer gene (rf). Hence, these two lines may be used for conversion into male sterility through back crossing to create genetic variability for male sterility in chilli.

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Table 2. Stable fertility restorer and sterility maintainer lines in chilli

No. Insert Free Population Section Free Population	Table 2. Stable fertility restorer and sterility maintainer lines in chilli										
No. Lines used population as male Fertile (%) fertile Fertile (%) fertile Remark plants in F ₁ Plants in F ₁ Plants in F				Tester used as female (CGMS)							
No. Lines used population as male Fertile (%) fertile Fertile (%) fertile Remark plants in F ₁ Plants in F ₁ Plants in F	S1	Cl E plant					TBGA1	,			
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2 JM-218					plants in F ₁		plants in F ₁		plants in F ₁		
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4 G-4	3	Pant C-1	40	40	100	40	100	40	100	Rf	
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Rf=Fertility restoration; rf=sterility maintainer