I J P S INTERNATIONAL JOURNAL OF PLANT SCIENCES
ISSN-0973-1547 Volume **14** | Issue 1 | January, 2019 | 25-27

DOI: 10.15740/HAS/IJPS/14.1/25-27
Visit us - *www.researchjournal.co.in*

RESEARCH ARTICLE

Identification of restorers and maintainers lines in rice (*Oryza sativa* L.)

■ **S.B. Verma**

SUMMARY

Three cytoplasmic genetic male sterile (cm) lines, mainly IR 58025 A, PMS 8 A and PMS 10 A were crossed with eight indigenous rice genotypes of saline alkaline and scented high yielding to identify their prospective restorers, partial restorers and effective maintainers. Study of F_1^S enabled to identify fourteen restorers ten partial restorers to CMS lines. None of the lines were found to be partial maintainers and effective maintainers for the CMS lines.

Key Words : Rice, CMS lines, Restorers, Maintainers

How to cite this article : Verma, S.B. (2019). Identification of restorers and maintainers lines in rice (*Oryza sativa* L.). *Internat. J. Plant Sci.*, **14** (1): 25-27, **DOI: 10.15740/HAS/IJPS/14.1/25-27,**

Article chronicle : Received : 16.10.2018; **Revised :** 06.12.2018; **Accepted :** 15.12.2018

Rice is most important cereal crops of global significance. It belongs to family Poaceae (Gramineae) having chromosome no (2 n = 2 x = 24). The success of hybrid rice breeding programme mainly depends on the identification, development, maintenance and evaluation of CMS lines (A-lines) their maintainers (B – lines) and effective restorers (R-lines). The method developing hybrid with the use of A, B and R line is popularly known as "three line breeding" approach in China. The identification of restorers and maintainers of CMS line is done by crossing CMS lines with large number of genetic stock. The impressive growth of agricultural productivity that transformed a food deficit nation in to a self sufficient one is a major accomplishment. The extensive adoption of the technological innovation of sixties in rice forming and rice based cropping system such as rice-wheat has been key to growth and stability of food grain production. India was too late in developing the adopting hybrid rice technology is spite of knowing its potential. When yield level of the high yielding varieties started stagnating at different levels even one tones advantage of the hybrid technology over the best verities is by any standard sizable grain. Significantly hardly any alternative technology capable of given 10-15 per cent higher yield. The cytoplasmic male sterile source of Wild Abortive is being used extensively in China and India for development of hybrids (Lin and Yuan, 1980). The restorers and maintainers for Wild Abortive cytoplasm were reported earlier by Rangaswamy *et al.* (1987); Rosamma and Vijay Kumar (2005); Raju Ram *et al.* (2006); Sabar *et*

AUTHOR FOR CORRESPONDENCE

S.B. Verma, Department of Genetics and Plant Breeding (Agricutural Botany), Udai Pratap Autonomous College, **Varanasi (U.P.) India**
Email : sbvermaupc@gmail.com

Table A: Salient feature of the genotypes used in present study

Sr.No.	Name female parents (CMS lines)	Parentage	Origin	Stature	Duration	Grain characters
1.	IR58025 A	WA	IRRI	dwarf	115 days	Long slender
2.	PMS 8 A	WA	Punjab	dwarf	128 days	Medium slender
3.	PMS 10 A	WA	Punjab	dwarf	130 days	Medium slender
	Pollen parents (Male)					
1.	NDRK 5026	IR4630-22-2-5-1-3/IR 15321-117-3-2-2	N.D.U.A. and T, Faizabad	Semi tall	125	Short bold
2.	NDRK 5023	Jaya/Dasal	N.D.U.A. and T, Faizabad	Semi tall	139	Short bold
3.	NDRK 5031	Lecing YA 1148/IR 9129-209-2-2-2-1/ IR 18272-27-3-1	N.D.U.A. and T, Faizabad	dwarf	132	Long slender
4.	NDRK 5032	IR 4630-22-5-1-3 Pokkeli	N.D.U.A. and T, Faizabad	dwarf	133	Long slender
5.	SWARNA	Vasisth/Mehsuri	Andhra Pradesh	dwarf	155	Medium slender
6.	MT 20-1-1	Vijay/ C 14-8	Andhra Pradesh	dwarf	125	Long bold
7.	NDR 507	Selection from SAR 43	N.D.U.A. and T, Faizabad	Tall	140	Short bold
8.	NDRK 5027	IR 10167-129-3-4 Nona Bhokga	N.D.U.A. and T, Faizabad	Semi tall	128	Short bold
9.	Sarjoo 52	T (N)/Kashi	N.D.U.A. and T, Faizabad	Semi dwarf	130	Long slender

al. (2007); Akhter *et al.* (2008); Ingale *et al* (2005); Siddiq (1997) and Parmita and Goswami (2017).

MATERIAL AND METHODS

In the present investigation twenty four crosses were made at Genetics and Plant Breeding Farm, Narendra Deva University of Agriculture and Technology Kumarganj, Faizabad, during *Kharif* (1996) to identify restorers and maintainers. The experimental material used for this investigation comprised of population of 24 F_1^{cs}, their parents 3 female, 8 male line and 1 standard variety used was Sarjoo 52 (Table 1). The F_1 hybrid and their parent seeds were sown on 20th June 1997 in nursery beds by treating with 0.2 per cent Bavistin solution for about a minute and then washed in water. After 25 days single seedling per hill were transplanted with 20 cm row to row and 15 cm plant to plant spacing having 4 rows of 2.5 meter long for each test entry in Randomized Black Design with three replications. The crop was maintained properly at 120:60:60 kg/ha NPK level and zinc sulphate at the rate of 25 kg/ha as usual half of the nitrogen and entire quantities of phosphorus, potash and zinc sulphate was applied as basal dose and two split application of remaining 60 kg/ha nitrogen was at tillering and panicle initiation stage. The experiment was grown under irrigated condition and all intercultural and plant protection measures were applied for raising good crop.

The identification of restorers and maintainers lines are based on 5 panicle taken from different plant of each F_1 hybrids at the maturity. The score was based on IRRI 1991 as follows >80% spikelets fertility (Effective restores and, respective pollen parent restorer line), 10 to 80 per cent spikelet fertility (Partial restorers), 1 to 10 per cent spikelets fertility (Partial maintainers) and < 1 per cent spikelets fertility (Effective maintainers).

The characters studied for present investigation were seedling growth (cm), days to 50 per cent flowering, plant height (cm) total number of tillers/plant, panicle bearing tillers/plant, panicle length (cm), spikelets per panicle, spikelets fertility per cent, test weight (g) and

Table 1 : Classification of rice genotypes in to effective restores (ER) effective maintains (EM) partial maintainers (PM) and partial restores (PR) for different CMS lines

Sr. No.	Genotypes	IR58025 A	PMS 8 A	PMS 10 A
1.	Swarna	ER (88.85%)	ER (85.47%)	ER (83.36%)
2.	MT 20-1-1	ER (87.43%)	PR (73.58%)	PR (76.51%)
3.	NDRK 5026	ER (87.72%)	PR (74.98%)	ER (80.11%)
4.	NDR 507	ER (81.29%)	ER (84.38%)	ER (84.28%)
5.	NDRK 5023	ER (80.02%)	PR (77.47%)	PR (78.75%
6.	NDRK 5031	PR (52.59%)	ER (81.95%)	ER (81.03%)
7.	NDRK 5027	PR (79.18%)	PR (79.98%)	ER (87.11%)
8.	NDRK 5032	PR (71.60%)	PR (77.18%)	ER (88.08%)

grain yield per plant (g).

RESULTS AND DISCUSSION

For IR 58025-A the perusal of data (Table 1) revealed that the spikelets fertility per cent varied from (88.85 to 52.59) per cent, Swarna was best restorer for IR 58025-A (CMS line) with highest spikelets fertility followed by MT 20-1-1, NDRK 5026, NDR 507 and NDRK 5023. Three varieties namely, NDR 507, NDRK 5032 and NDRK 5031 were identified as partial restorers with CMS line that ranged between (79.18 to 52.59) per cent for spikelets fertility. None of the varieties were found as partial maintainers and effective maintainers with this line. In PMS 8 A. The perusal of data (Table 1) exhibited that spikelets fertility percentage ranged from (85.47 to 73.58) per cent. Swarna was best partial restorer with this CMS line which had (85.47) per cent spikelets fertility followed by NDR 507 and NDRK 5031. Five varieties were identified as partial restorers having spikelet fertility percentage between (78.98 to 73.58) per cent. These were NDRK 5027, NDRK 5023, NDRK 5032, NDRK 5026 and MT 20-1-1. None of the variety was found partial and effective maintainers.

In PMS 10 A (CMS line) The spikelet fertility percentage (88.08 to 76.51) per cent given in (Table 1) NDRK 5032 was found restorer with PMS 10 A exhibiting (88.08%) spikelets fertility. Next to this were NDRK 5027, NDR 507, Swarna, NDRK 5031 and NDRK 5026. Only two varieties NDRK 5023 and MT 20-1-1 were found good partial restorers. None of the variety identified as partial maintainer as well as effective maintainer with this CMS line. The result showed that lines such as Swarna, MT-20-1-1, NDRK 5026, NDR 507 and NDR 5031 were complete restorers while NDRK 5027, NDRK 5032, NDRK 5031 were partial restorers for CMS line IR 58025 A. The lines such as Swarna, NDR 507 and NDRK 5023 were observed complete restorers, while NDRK 5027, NDRK 5023, NDRK 5032, NDRK 5026 and MT 20-1-1 were partial restorers for PMS 8 A. Out of eight lines tested with PMS 10 A NDRK 5032, NDRK 5027, NDR 507, Swarna, NDR 5031 and NDRK 5026 were found complete restorers while NDRK 5023 and MT 20-1-1 were found partial restorers. The line NDR 507 and Swarna were restorers for IR 58025 A, PMS 8 A PMS 10 A while, NDR 5027 and NDR 5032 which restored the fertility for IR 58025 A and PMS 8 A act as partial restorer.

A such differential response of some cultivar to three CMS line could be due to nuclear genes of maternal parent which might interact in different ways. Another reason could be that the cultivars might not be genetically pure for restoration ability and weak restorer genes interact differentially leading to different results.

REFERENCES

Akhter, M., Zaid, M.A., Ahmad, M. and Haider, Z. (2008). selection of restorers and maintainers from test crosses for development of rice hybrids. *Pakistan J. Sci.*, **60** : 100-102.

Ingaie, B.V.,Waghmode, B.D. and Hoadwadekar, S.S. (2005). Identification of restorers and maintainer for various CMS lines in rice. *J. Maharastra Agric. Univ.*, **30**:163-166.

Lin, S.C. and Yuan, L.P. (1980). *Hybrid rice breeding in China. Innovative approaches to rice breeding*. International Rice Research Institute Los Banos, Philippines, pp. 35-51.

Parmita, Prgya and Goswami, Ashish (2017). Identification of restorers and maintainers for WA based Indica CMS lines of rice. *Internat. J. Plant Sci.*, **12** (2): 125-130, DOI: 10.15740/HAS/IJPS/12.2/125-130.

Raju Ram, Sharma, Deepak, Chaudhary, Mangla, Sao, Abhinav and Gauraha, Deepak (2006). Identification of restorers and maintainers for hybrid rice development in Chhatishgarh. *Internat. J. Agric. Sci.*, **2** : 654.

Rangaswamy, A., Burke, Raymound R.,Wind, J. and Eliashberg, J. (1987). Expert systems for marketing. Working Paper, Marketing Science Institute, Report No. 87-107.

Rosamma ,C.A. and Vijay Kumar, N.K. (2005) Maintainers and restorers for cms lines of rice. *J. Trop Agric.*, **43**:73-77.

Siddiq, E.A. (1997). Current status and future outlook for hybrid rice technology in india. In : *Hybrid Rice. A key to success* (ed. R. Vijaya Kumar and P.S.S. Murthy) Acharya N.G. Ranga Agricultural University, Agricultural Research Station, Maruteru. pp.1-34.