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Research Article

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Germination Studies in Hybrids Derived from Diverse CMS Sources in Sunflower (*Helianthus annuus* L.)

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ABSTRACT

A study was conducted to evaluate germination percentage of hybrids derived from diverse CMS sources in sunflower. The seeds sampled for germination test showed significant variation at immediately after harvest, 15 DAH, 30 DAH and 45 DAH period. Immediately after harvest, higher (8.07 %) germination per cent was found in the cross CMS335A × RHA95C1 and lower (4.11 %) in IMS850A × NS8. Whereas at 15 DAH, 30 DAH and 45 DAH the higher (22.33 %, 64.00 % and 92.33 %, respectively) germination was recorded in FMS852A × RHA6D1 followed by (19.00 %, 63.67 % and 91.67 %, respectively) in CMS851A × NS15 and lower (4.95 %, 14.33 %, 53.00 % and 83.67 %, respectively) germination was recorded in FMS407A × RHA95C1. But at 60 DAH, there was no significant variation between hybrids, as all the hybrids varied between 98 to 100 per cent germination due to complete removal of dormancy.

Keywords: *Dormancy, Germination percentage, DAH, Diverse CMS source based hybrids*

INTRODUCTION

The emergence from the seed embryo and development of those essential structures, which indicate the ability of the seed type tested to develop into a normal plant under favourable environment (ISTA) refers to germination. Germination is a very complex physiological process that is controlled by a range of developmental and external cues. Genetic and physiological studies have shown the important role played by plant hormones in regulating seed germination (Karssen et al., 1989; Jacobsen et al., 2002). GA and ABA play an important role in seed germination process. Seed germination is influenced by dormancy in many crops. Dormancy is also an important component of physiological quality of sunflower seeds. Seed domancy varies widely among the cultivated crops and varieties. While, seed dormancy in sunflower genotypes is a boon to the farmers, as it safeguard the crop from pre-harvest sprouting due to untimely rains during maturity, however, longer period of seed dormancy is not desirable as they cannot use the seed for sowing immediately after harvest (Subramanyam et al., 2002). It is particularly considered disadvantageous in seed production programmes, wherein, continuous germination of seeds is required.

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Seed of sunflower exhibit a dormancy period ranging from 35-45 days after harvest. In recent years, methods for breaking dormancy have been recommended. Growth hormones such as gibberellic acid and ethrel are prominently used, but, their usage is very restricted because of prohibitive cost. Therefore, the present investigation was undertaken to know the period of natural dissipation of dormancy in the sunflower hybrids and their parental lines.

The embryos of sunflower are capable of germinating after 12-16 DAA followed by deep dormancy at 20-30 DAA due to accumulation of Abscisic acid (Le Page et al., 1996) and presence of thick pericarp and seed coat (Subrahmanyam et al., 2002). However, the embryos gained germination capacity at 40 DAA (Ramazunova, 1994). At the time of maturity, the balance in promoterinhibitor is more towards inhibitors, thus imposing dormancy.

MATERIAL AND METHODS

The newly developed hybrids derived from diverse CMS sources *viz.*, CMS335A × RHA95C1, FMS407A × RHA6D1,FMS407A × RHA95C1,FMS852A × RHA6D1, IMS850A × NS8, FMS407A × NS8, CMS711A × DSR35, CMS851A × NS15, FMS407A × NS19, CMS234A × RHAIV77,CMS607A × R59 were sampled at regular intervals examined for germination test at immediately after harvest , 15DAH, 30 DAH, 45DAH and 60 DAH. One hundred seeds of four replicates were drawn at random from each hybrid and the germination test was conducted using between paper (BP) method as per ISTA (2006). The rolled towels were incubated in germination chamber maintained at 25 ± 1°C with 90 per cent relative humidity and percentage germination was expressed based on normal seedling percentage.

RESULT AND DISCUSSION

The germination percent was assessed in all the hybrids by germination test at different periods of immediately after harvest**,** 15 DAH, 30 DAH, 45 DAH and 60 DAH under dry storage conditions. The time taken for all the seeds to germinate in different hybrids for germination percentages are presented in Table 1, Plate 1 and figure 1.

The seeds sampled for germination test showed significant variation at immediately after harvest, 15 DAH, 30 DAH and 45 DAH period. Immediately after harvest, higher (8.07 %) germination per cent was found in CMS335A × RHA95C1, followed by CMS851A × NS15 (7.95 %) and lower (4.11 %) in IMS850A × NS8.

Whereas at 15 DAH, 30 DAH and 45 DAH the higher (22.33 %, 64.00 % and 92.33 %, respectively) germination was recorded in FMS852A × RHA6D1 followed by (19.00 %, 63.67 % and 91.67 %, respectively) in CMS851A × NS15 and lower (4.95 %, 14.33 %, 53.00 % and 83.67 %, respectively) germination was recorded in FMS407A × RHA95C1.

But at 60 DAH, there was no significant variation in germination percentage was noticed between hybrids, as all the hybrids varied between 98 to 100 per cent germination. These results are in conformity with the findings of Pallavi et al (2014) wherein she reported freshly harvested seeds of KBSH44 recorded zero per cent germination. The germination per cent has increased from freshly harvested seed to 60DAH. There was gradual decrease in per cent dormancy and increase in germination per cent. Seeds attained maximum germination (100%) at 60 DAH and required 40-45 days to attain full germination capacity. This confirmed the presence of dormancy in freshly harvested seeds of sunflower.

However, the seeds attained 85.5 per cent of germination at 40 DAH which is more than the Indian Minimum seed certification Standards. Thus, the seeds of sunflower could be safely used for sowing after 30 to 40 days after harvest. However, complete elimination of dormancy was observed only after 60 DAH. The dormancy in sunflower is mainly due to under developed embryo and disappears during dry storage due to interference of endogenous ethylene in alleviation of

dormancy in sunflower (Oracz et al., 2008). Bianco et al. (2008) also reported dry storage for a six week eliminated the dormancy completely in sunflower seeds. The seeds germinated due to suppression of activity in the axis to synthesise ABA during the course of six week dry storage.

Table 1: Seed germination percentage in hybrids developed from diverse CMS sources in sunflower (*Helianthus annuus* L.)

(Germination percentage)					
Hybrids	**Immediately after harvest**	**After 15 days of harvest**	**After 30 days of harvest**	**After 45 days of harvest**	**After 60 days of harvest**
FMS852A×RHA6D1	8.31	22.33	64.00	92.33	100.00
FMS407A×RHA95C1	3.95	14.33	53.00	83.67	97.33
FMS407A×NS19	6.43	16.33	56.67	86.67	98.33
FMS407A×RHA6D1	5.76	18.33	60.33	89.33	99.33
FMS407A×NS-8	6.21	17.00	59.00	87.00	98.00
IMS850A×NS8	6.11	18.00	60.33	88.00	98.67
CMS607A×R59	7.05	15.33	57.00	86.67	98.33
CMS851A×NS15	7.95	19.00	63.67	91.67	100.00
CMS711A×DSR35	6.32	20.00	63.33	91.00	99.33
CMS234A×RHAIV77	4.52	15.00	58.67	85.33	97.67
CMS335A×RHA95C1	8.07	19.00	62.67	89.67	99.00
S.Em±	0.66	0.73	0.54	0.66	0.61
(CD =0.01)	1.96	2.17	1.60	1.95	1.81

Plate 1. Seed germination percentage at immediately after harvest, 15, 30, 45 and 60 DAH in hybrids derived from diverse CMS sources in sunflower

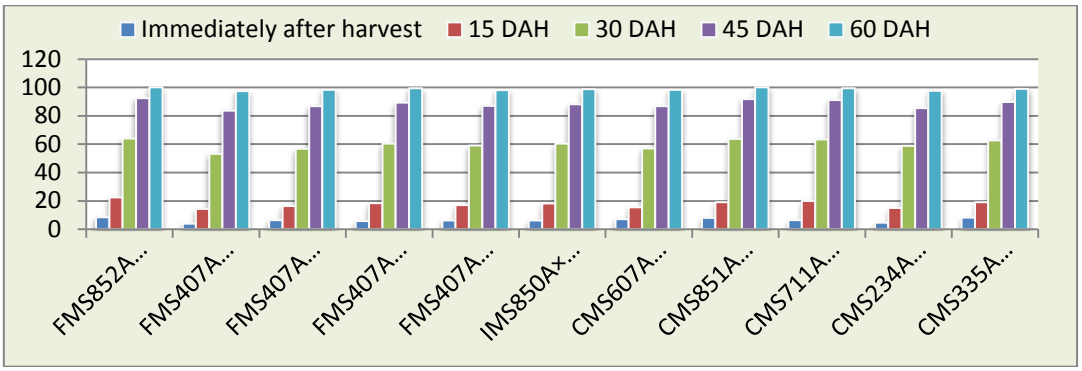

Fig. 1: Seed germination percentage at immediately after harvest, 15, 30 , 45 and 60 DAH in hybrids derived from diverse CMS sources in sunflower

CONCLUSION

Dormancy being an inherent part of sunflower seeds, the hybrids derived met minimum standards of certification for germination by 45 days but a complete removal of dormancy was noticed 60 days after harvest. Thus, in the study undertaken of hybrids derived from diverse CMS sources, all the seeds of different hybrids showed complete germination after three months which indicated to store these hybrids for three months under dry storage to use for sowing purpose.

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