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Short Communication

Induced mutagenic effect of chemical and physical mutagens on pollen sterility in sunflower (Helianthus annus L.)

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Abstract

Sunflower [Helianthus annus L.] belongs to family composite (Asteraceae). In the present study experimental seeds of two sunflower cultivars namely 'Bhanu' and 'SS-56' treated with various concentration of chemical mutagens [EMS and SA] and physical mutagen (Gamma rays). Effect of these mutagens on pollen sterility were studied in M 1 generation. The maximum pollen sterility in the variety of Bhanu (71.42%) could be observing in gamma ray 10 kR while variety of SS--56 (42.32%) observed in EMS 0.10 %. The induced mutation plays an important role in crop improvement, either through physical and chemical mutagens.

Keywords: Induced, Mutagenic effect, Mutagens, Pollen sterility, Sunflower (Helianthus annus L.).

Introduction

Sunflower (Helianthus Annuus L.) is an erect fast growing, annual herb with rough hairy stems and broad leaves. The name helianthus is derived from Greek "Helios" (sun) and anthos (flower) in reference to the tendency of this plant to turn the flower head toward the sun (Heliotropism). This phenomenon which affects the inflorescence during the development phase and young leaves, it ceases to onset of the flowering and by this time most of the flowers remains turned towards east southeast.

Sunflower also known as 'Surajmukhi' were cultivated for its seeds is the world's fourth largest oil seed crop. The seed contains 45--50% good quality oil. Sunflower oil is used for edible purposes. Sunflower are over 50 species of genus Helianthus of which only 2 species, a diploid annual H. annus (2n = 34) and hexapody perennial H. tuberous (2n= 102) are cultivated.

The former is grown as an oil seed crop, while the later as a field crop for its tubers, sunflowers is cultivated globally on 21.48 m. ha with production of 26.47 million Tones. Its cultivation is mainly concentrated in Europe, particularly Russian federation, Argentina, Ukraine etc.

Materials and methods

The experimental seeds of sunflower (Helianthus annus L.) 'Bhanu' and 'SS-56' cultivars were collected from Dry farming research station, solapur 413002 (MS) India. Healthy dry and uniform seeds of sunflower for physical mutagenic treatment were irradiated with 10kR, 20 kR, 30 kR of gamma rays from 60 co source at Gov. Institute of science, caves road. Aurangabad. (MS), India. In chemical mutagenic treatments two mutagen namely ethyl methane sulphonate ($CH_3SOO_2CH_5$) with molecular weight 124.16 and sodium azide (NaN_3) with molecular weight 65.01g were practiced. For chemical treatment experimental seed were presoaked in distilled water for 6 hr. and the wet seeds were treated with different concentration of EMS such as 0.05%, 0.10% and 0.15% and SA such as 0.01%, 0.02% and 0.03% for 4 hours.

Pollen sterility: In observation of pollen sterility 15 plants are selected belonging to the each mutagenic treatment [chemical treatment] and [physical treatment] the both cultivars of sunflower along with control. Collected sample used stained it 1.5% acetocarmine. The stain was applying a fresh dehisced anther of pollen grains. As per above observation stained counted as fertile and shriveled counted as sterile.

Various statistical data were calculated using the following formulas:

Results and discussion

In the present investigation, effect of gamma rays, EMs and SA on pollen sterility was observed. The maximum sterility percentage observed in [Gamma ray 10 kr] dose bhanu 71.42% and ss-56 43.05% [EMS 0.10%] Mutation breeding has an alternative to hybridization as a source of variability[1-3].

Through effective selection, varieties with desirable features developed out of the mutated population[4]. The increasing pollen sterility has been mainly attributed to chromosomes interchange, chromosomal aberration gene mutation[5,6].

Table-1: Effect of Mutagens on pollen sterility in sunflower [Helianthus Annus L.] Variety – Bhanu.

Mutagen	Dose/ Concentration	Mean	C.V.	S.E
Control	-	14.07	1.1	0.1
EMS (%)	0.05	21.72	1.1	0.1
	0.10	31.78	0.8	0.2
	0.15	37.77	0.8	0.2
S.A (%)	0.01	22.40	1.2	0.2
	0.02	68.04	0.3	0.4
	0.03	50.47	0.8	0.2
Gamma Rays	10 kR	71.42	0.5	0.3
	20 kR	33.11	0.5	0.2
	30 kR	29.36	0.7	0.2

Table-2: Effect of Mutagens on pollen sterility in sunflower [Helianthus Annuus L.] Variety: SS-56.

Mutagen	Dose/Concentration	Mean	C.V.	S.E
Control	-	17.26	1.5	0.2
EMS (%)	0.05	19.69	1.1	0.1
	0.10	43.05	0.7	0.4
	0.15	35.80	0.6	0.4
S.A (%)	0.01	19.76	1.1	0.1
	0.02	42.32	0.9	0.3
	0.03	17.08	0.7	0.1
Gamma Rays	10 kR	22.53	1.5	0.2
	20 kR	17.61	1.5	0.2
	30 kR	11.49	1.4	0.1

Figure-1: Total Field of Sunflower.

Figure-2: Immature bud.

Figure-3: The Inflorescence begins to open.

Figure-4: Beginning of flowering.

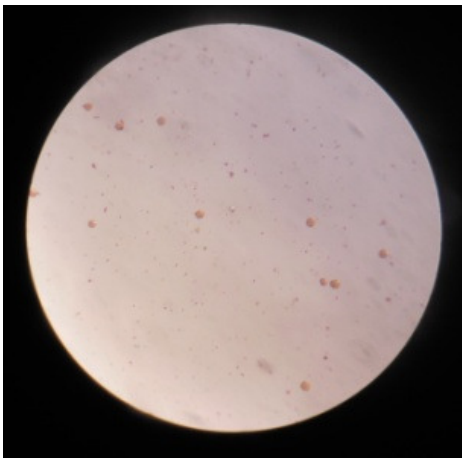

Figure-5: Complete Slide View.

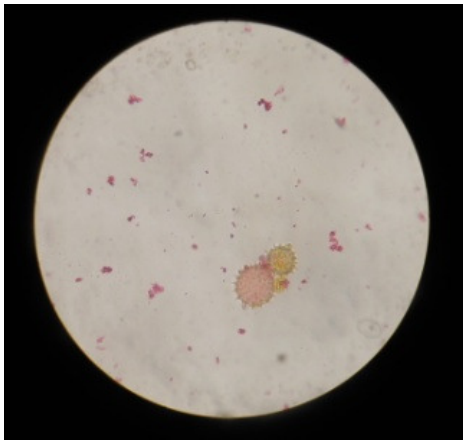

Figure-6: Sterile and Fertile Pollen.

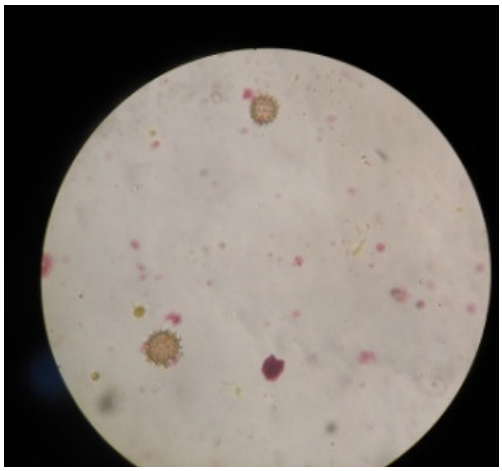

Figure-7: Sterile Pollen.

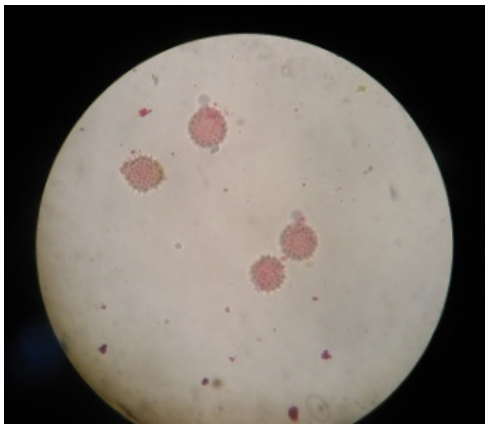

Figure-8: Fertile Pollen.

Conclusion

In the present study 3 mutagen [gamma ray, EMS, SA] showed maximum pollen sterility was observed in gamma ray 10 kr, followed by EMS 0.10%. In M1 generation it's concluded that inhibitory effect on pollen sterility percentage. And wide range of mutagens.

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