The magnitude of the positive or negative shift of the vegetative traits (number, length and breadth of leaves and diameter of pseudostem) was greater in both V_2M_1 and V_3M_1 generations in progenies after EMS treatments in both varieties. Genetic parameters, association analysis and regression analysis revealed the strong association of the bulb characters (diameter and volume) and clove characters (volume, weight and diameter) on bulb yield. For most of the traits stronger regression was exhibited by 2.5 Gy + 20 mM combination treatments in all generations. Consistently higher variability, skewness and kurtosis for the bulb and above characteristics in all generations indicated that top priority should be given to these traits when selecting mutants during crop improvement programmes. Continuous significant positive regression value indicated that bulb diameter is the best selection index. Four hundred and seventy-one viable economic mutants in Mettupalayam (Table 1) and seventy-seven in Ooty-1 (Table 2) with higher bulb yield contributing traits, besides tolerance to rubberisation, have been isolated for further evaluation.

Table 2. Frequency and spectrum of viable mutations in V_2M_1 generation of parent variety Ooty - 1

Treatments	Gamma (Gy)		EMS (mM)				Gamma (Gy) + EMS (mM)			
	2.5	5.0	15	20	25	30	2.5+20	2.5+25	5.0+20	5.0+25
No. of plants scored	864	408	1136	1048	528	396	560	468	412	348
No. of viable mutants observed	104	48	62	123	91	121	135	56	26	25
Total mutation frequency per 100 V_2M_1 plants	12.04	11.76	5.46	11.74	17.23	30.56	24.11	11.97	6.31	7.18
Tall types	0.00	0.00	0.00	2.19	2.84	3.54	5.36	0.85	0.00	0.00
Dwarf	2.55	4.90	0.79	0.38	0.19	0.51	0.89	1.07	1.46	3.16
Luxuriant types	0.00	0.00	0.00	0.38	0.76	2.78	2.86	0.85	0.00	0.00
Needle leaves	8.47	1.72	0.00	0.38	0.19	0.25	0.18	0.64	1.46	2.59
Short leaves	0.00	0.00	0.00	0.00	0.00	0.25	0.36	0.00	0.00	0.00
Loose culm types	2.78	3.19	3.17	5.25	7.95	9.60	4.29	3.21	1.94	1.15
Flower stalk with two tier aerial bulbs	0.00	0.00	0.00	0.00	0.00	0.00	0.89	0.00	0.00	0.00
Early maturing	0.81	0.00	0.00	0.00	0.00	2.02	0.89	1.07	0.00	0.00
Pink tunicated bulbs with white cloves	0.35	0.25	0.00	0.29	0.76	1.26	1.79	0.43	0.00	0.00
Flat bulbs	0.35	0.00	0.00	0.00	0.00	0.00	0.89	0.43	0.24	0.00
Double bulbs	0.35	0.00	0.00	0.19	0.76	1.01	1.25	0.21	0.00	0.00
Triple bulbs	0.00	0.00	0.00	0.00	0.00	0.25	1.07	0.43	0.00	0.00
Multiple bulbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rubberised bulbs	1.39	1.72	1.50	2.61	3.19	9.10	3.39	2.78	1.21	0.29

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INDUCED MUTANT FOR MALE STERILITY IN NIGER

Niger (*Guizotia abyssinica* Cass.), an important oilseed crop of the family Compositae is highly cross-pollinated due to the twin mechanisms of protandry and incompatibility. Studies revealed the functional nature of protandry and the breakdown of incompatibility with alteration in temperature [1]. It has very small flowers (disc florets) arranged in a capitulum that open on 3-4 consecutive days which pose problems in emasculation for cross-breeding. To

induce mutations, seeds of variety 'IGP-76' were irradiated with γ-rays 200 to 1000 Gy. All seeds of M_1 plants were sown separately in individual plant-to progeny rows. The results of screening of M_2 segregating material indicated that γ-ray treatment was effective in induction of male sterility. Frequency of visible mutations were higher in sibbed progeny as compared to open pollinated population and male sterile plants were observed only in sibbed population (1000 Gy). Male sterile plants could easily be identified at the flowering stage by their altered floral morphology (disc florets transformed into ligulate ray florets) and complete absence or presence of a rudimentary anther column. Seeds were collected following sib-mating with the fertile counterparts. Progeny segregated in a ration of 3 normal : 1 male sterile. Further work on the mechanism of sterility, maintenance and linkage relationships with associated characters is under progress. This is the first report of induction of male sterility in niger through the use of physical mutagens. The availability of this mutant will be of great value for exploitation of heterosis on commercial basis.

REFERENCES

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PRODUCTIVE MUTANTS OF NIGER

Seeds of six niger (*Guizotia abyssinica* Cass.) varieties ('GA-10', 'ONS-8', 'IGP-72', 'N-71', 'NB-9' and 'UN-4') were treated with 0.5, 0.75 and 1% ethyl methanesulphonate. After four generations of selection, 29 mutant lines were developed and those were evaluated from 1990-92 during Kharif (July to October) and Rabi (December to March) seasons. Average plant characteristics and yield data of four high yielding mutants along with 'IGP-76' (National Check), GA-10 (Zonal Check) and 'Semiliguda Local' (Local Check) are presented in the Table 1. The high yielding mutants, their parental varieties, mutagenic origin and major characteristic improvement over check varieties are as follows:

ONS-107: (GA-10, 0.75% EMS) - more capitula/plant and seeds/capitulum with high yield

ONS-114: (ONS-8, 1% EMS) - moderately high capitula/plant, high seeds/capitulum and 1000-seed weight and high yield

ONS-125: (NB-g, 1% EMS) - larger capitula with more seeds/capitulum, high 1000-seed weight and high yield

ONS-130: (UN-4, 0.25% EMS) - early flowering and maturity short plant height with more seeds/capitulum, height 1000-seed weight and high yield.