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Effects of gamma rays on rusts and yield attributes of some wheat genotypes

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Introduction

Wheat rusts are the most destructive diseases with a dynamic nature. Stripe rust (*Puccinia striiformis* f.sp. *tritici*) is the most important among all wheat rusts that cause yield losses ranged from 10-70% (**Chen 2005**). Moreover, leaf rust caused by *Puccinia triticina* f. sp. *tritici* is the most common disease in wheat plants and makes loss yield due to low kernel weights and decreased kernel numbers per head (**Goyeau *et al*., 2007**).

Breeding against biotic stresses in wheat is a well-established strategy. The choice of methods and strategies for inducing and improving crop plant resistance against biotic stresses mainly depends upon the availability of resistance sources. The breeding strategies can be divided into classical and modern methods. The use of physical mutagens, like gamma rays is well established for inducing useful mutants has been used in many crops such as wheat, rice, etc. (**Marcu et al., 2013).** The induced mutation help breeders to develop many agronomical important traits such as shorter growing period, increased tolerance or resistance to biotic stresses (**Kenzhebayeva et al., 2013**).

Consequently, the present work was planned to induce mutations for resistance against major diseases like stripe and leaf rusts in five Egyptian wheat cultivars using direct seed gamma irradiation.

Materials and Methods

The present investigation was performed under field conditions of Wheat Diseases Research Department, at the El-Gemmeiza Agriculture Research Stations, Plant Pathology Research Institute (PPRI), Agricultural Research Center (ARC), Egypt, to evaluate five wheat genotypes *i.e*. GIZA 168, NING MAI 50-0CHN, SAKHA 93, SIDS 12, SKAUZ were exposed to five doses of gamma rays *i.e*. (5, 10, 15, 20 and 25 Kr) to stripe and leaf rust diseases.

Results and Discussion

The Interactions between wheat genotypes and gamma rays had highly significant effect on rust severity. In both crop seasons, leaf and stripe rust severity decreased with increasing the rate of radiation (Table 1). Highly significant differences were detected among the tested wheat genotypes regarding to germination and yield parameters, Figure (1), Tables (2).

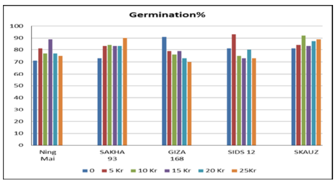

Fig. 1. Germination percentage as affected by gamma rays and wheat genotypes.

Table 1. Effect of different gamma rays on leaf and yellow rust under wheat lines.

	Leaf rust		Yellow rust	
Treatments	2021	2022	2021	2022
A. Lines				
NING MAI 50-0CHN	4.40	8.86	6.90	3.73
SAKHA 93	1.76	4.66	0.86	4.4
GIZA 168	0.43	0.33	9.23	5.66
SIDS 12	0.66	0.83	33.06	26.53
SKAUZ	10.66	15.6	4.4	1.7
F. test	*	*	**	**
L.S.D. at 0.05	6.79	9.76	12.6	12.06
B. Radiation				
0 Kr	11.8	18	28.8	21.48
5 Kr	7.4	12.2	18.24	12.8
10 Kr	2.3	5.6	9.2	6.52
15Kr	0.0	0.64	5.44	3.00
20 Kr	0.0	0.0	3.2	1.6
25 Kr	0.0	0.0	0.48	0.24
F. test	**	**	**	*
L..S.D at 0.05	7.44	10.69	13.80	13.21

Table 2. Number of spikelets, number of grains, 1000 grain weight, grain yield as affected by gamma radiation and wheat lines during both seasons.

	No. of spikelets		No. of grains		1000 grain weight		Grain yield	
Treatments	2021	2022	2021	2022	2021	2022	2021	2022
A.Lines								
NING MAI 50-0CHN	23	25	69	78	42.33	42.38	24.39	27.83
SAKHA 93	25	25	78	71	41.05	41.5	25.44	31.28
GIZA 168	24	24	69	68	35.33	36.33	25.94	25.05
SIDS 12	24	23	74	67	38.38	40.83	25.55	34.94
SKAUZ	23	24	71	70.9	38.72	41.44	31.72	35.17
F. test	*	*	**	**	**	**	**	**
L.S.D. at 0.05	1.5	1.2	1.7	1.6	1.32	1.37	1.429	1.772
B.Radiation								
0 Kr	22	25	67	71	41.33	40.73	25.73	29.133
5 Kr	23	25	70	73	44.61	40.53	26.73	33.00
10 Kr	23	23	69	67	40.53	40.13	24.47	28.26
15Kr	24	24	76	71	39.13	42.46	24.86	29.933
20 Kr	24	24	76	70	41.41	43.13	26.53	32.41
25 Kr	26	25	75	75	40.00	39.61	26.53	32.41
F.test	**	NS	**	**	**	**	NS	**
L.S.D at 0.05	2.02	-	2.3	1.6	1.41	2.21	-	1.294
Interactions								
AXB	NS	NS	**	**	**	**	**	**

Selected Reference

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