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EFFECT OF RADIATION ON SOME MORPHOLOGICAL AND
PHYSIOLOGICAL CHARACTERS OF BARLEY PLANT GROWN UNDER DROUGHT CONDITIONS

By
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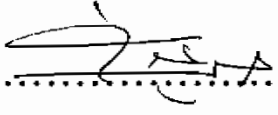
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- 1 -

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Abstract

The work of this study was divided into two groups, the first one is the trials of field which were carried out to evaluate the effect of presowing exposure grains to gamma-irradiation on some morphological and physiological characters of barley cultivars grown under drought conditions. Gamma-irradiation with 2000 R was the promising treatment for growth and yield. The response of cultivar (Giza 121) to gamma-rays overcome the other studied cultivars. Irradiation with gamma-rays decreased the rate of growth reduction as a result of exposing to drought. The results accentuated that presowing Giza 121 grain exposure to gamma irradiation decreased the growth reduction as a result of exposing to drought comparing to the same treated (Giza 163) cultivar. Presowing exposure grains to gamma radiation with 2000R dose elevated the values

of grain yield/faddan and straw yield / faddan under drought conditions,i,e.,irrigation once at tillering or flowering or grain filling.

Gamma radiation led to increase auxin and gibberlin levels especially grains treated With 2000 R which showed highly significant levels whereas the highest levels of auxin and gibberellins inhibitors were obtained in the grains exposed to 6000 R.

These results were true in grains, leaves and seedlings of 7 as well as 14 days.

Exposing barley grains to 2000 R dose increased DNA and RNA content in leaves and seedlings but 4000 R and 6000 R doses decreased them.

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CONTENTS

	Page
INTRODUCTION.....	1
REVIEW OF LITERATURE	3
I Effect of gamma-rays irradiation.....	3
1 Germination percentage.....	3
2 Growth criteria	4
3 Auxins, gibberellins, DNA and RNA	8
4 Yield and its attributs.....	9
5 Protein content.....	12
II. Effect of drought on.....	13
1 Growth characters	13
2 Yield and its components.....	16
3- Protein content.....	18
MATERIALS AND METHODS	20
RESULTS AND DISCUSSION.....	30
I- Effect of gamma-rays.....	30
1 germination percentage.....	30
2- Growth criteria.....	34
3 Yield and its components.....	44
4 Protein content DNA and RNA	62
5 Endogeneous auxins, gibberellins and their inhibitors...	66
II- Effect of drought	79
1- Growth criteria.....	79
2 Yield and its components.....	86
3 Protein content.....	97
III Effect of interactions.....	98
SUMMARY.....	101
REFERENCES.....	110
ARABIC SUMMARY	

List of Tables

	Page
1 - Effect of gamma - rays irradiation on germination percentage of some barley cultivars.	31
2 - Effect of gamma - rays irradiation on growth criteria of some barley cultivars in the first season (1984/1985)	33
3 - Effect of gamma - rays irradiation on growth criteria of some barley cultivars in the second and third seasons (combined analysis of 1985/1986 and 1986 / 1987)	36
4 - Effect of gamma - rays irradiation on growth criteria and yield components of Sahrawi 100 at harvest in 1984/1985	38
5 - Effect of gamma - rays irradiation on plant height (cm) of some barley cultivars grown under drought conditions (at harvest)	40
6 - Effect of gamma - irradiation on number of tillers of some barley cultivars grown under drought conditions.	41
7 - Effect of gamma - rays irradiation on number of leaves of some barley cultivars grown under drought condition	42
8 - Effect of gamma - rays irradiation on spike length (mm) of some barley cultivars grown under drought conditions.	45
9 - Effect of gamma - rays irradiation on number of spikes of some barley cultivars grown under drought conditions.	46
10 - Effect of gamma - rays irradiation on total number of spikelets per spike of some barley cultivars grown under drought conditions.	47

	Page
11 - Effect of gamma - rays irradiation on number of fertile spikelets per spike of some barley cultivars grown under drought conditions.	50
12 - Effect of gamma - rays irradiation on number of sterile spikelets per spike of some barley cultivars grown under drought conditions.	51
13 - Effect of gamma - rays irradiation on grain yield of some barley cultivars grown under drought conditions.	53
14 - Effect of gamma - rays irradiation on fresh weight of some barley cultivars grown under drought conditions.	54
15 - Effect of gamma - rays irradiation on dry weight of some barley cultivars grown under drought conditions.	55
16 - Effect of gamma - rays irradiation on straw yield of some barley cultivars grown under drought conditions.	56
17 - Effect of gamma - rays irradiation on 1000 grain weight of some barley cultivars grown under drought conditions.	57
18 - Effect of gamma - rays irradiation on yield index of some barley cultivars grown under drought conditions.	59
19 - Effect of gamma - rays irradiation on harvest index of some barley cultivars grown under drought conditions.	61
20 - Effect of gamma - rays irradiation on protein content (%) of flag leaves of some barley cultivars grown under drought conditions.	63
21 - Effect of gamma rays irradiation on DNA and RNA (mg/g.D.W.) seedlings and leaves which grown in glasshouse .	64

List of Figures and Plates

	Page
1 Effect of gamma irradiation on endogenous auxins and their inhibitors of barley grains grown under glasshouse conditions.-----	69
2 Effect of gamma irradiation on endogenous auxins and their inhibitors of barley leaves grown under glasshouse conditions.-----	71
3 Effect of gamma irradiation on endogenous auxins and their inhibitors of seedlings extract of barley grown under glasshouse conditions.-----	73
4 Effect of gamma irradiation on gibberelins and their inhibitors of barley grains grown under glasshouse conditions.-----	76
5 Effect of gamma irradiation on gibberellins and their inhibitors of barley leaves grown under glasshouse conditions.-----	78
6 Effect of gamma irradiation on gibberellins and their inhibitors of seedling extract of barley grown under glasshouse conditions.	80
 Plate 1- A, B and C Comparison between seedlings of 2000 R and control , . 2000 Rad and 4000 Rad, and 2000 Rad and 6000 Rad.-----	 66
Plate 2 Effect of gamma rays on barley A- Single seedling, B and C seedlings.-----	67

INTRODUCTION

Limited water availability is one of the most widespread environmental constraints on plant growth and yield. North Africa is suffering from water deficit where a lot of cultivated area depends on limited rainfall. The coastal region which extending from Libya boundaries to Alexandria is characterized with irregular precipitation in its amount and distribution, it ranged between 87 to 295 mm. (Abdel-Rahman et al 1972). But in the depression areas, the received great run-off. Such rainfall is concentrated during the period of October to May.

Plants differ greatly in their resistance to drought, consequently, it is possible to distinguish three types of drought resistance i.e drought escape, drought avoidance and drought tolerance.

Several million hectares of barley are grown under rainfed dryland conditions with moderate precipitation. In Egypt barley is grown under rainfed conditions throughout the western north coastal region of the Mediterranean Littoral. This region is characterised with unpredictable drought, poor nutrient availability, inadequate crop-stand, low moisture retention and poor recovery rate.

Various methods to induce drought resistance in barley plants have been suggested from time to time. Among these, exposure grains to gamma rays may play a role. Observations on the survival capacity of barley plants under wilting

conditions were distinctly affected by presowing exposure of barley seeds to gamma radiation (Garg et al. 1972).

Growth response to radiation depends upon several factors such as plant cultivars, dose and growing conditions (Erickson et al. 1979), so radiated grains and suitable cultivars may be one of the most important factors that play a role in solving this problem. Consequently, this study was designed to investigate the response of some barley cultivars to drought after exposure presowing grains to gamma radiation on growth, chemical contents, yield and its components.

- 3 -
REVIEW OF LITERATURE

I- Effect of gamma-rays irradiation :

1- Germination percentage :

Sydorenko (1962) found that presowing exposure of maize kernels with 1 or 2 k.rad stimulated and raised the energy of germination power by 17-20%. Similarly Romenskii et al. (1963) reported that pre-sowing irradiation of maize grains by gamma-rays doses up to 10 k.rad had a stimulating effect on germination rate, while higher doses inhibited it.

Siyanova (1963) and Matsumura (1966) found that higher doses of gamma-rays caused significant decrease in the germination rate of wheat cultivars, delayed germination and seedling emergence.

Amer and Hakeem (1964) stated that irradiated wheat grains with gamma rays by the rate of 4, 7, 12, 16, 20 and 25 k.rad did not affect the germination percentage and rate. Also El Bastawesy and Masry (1971) found no significant effect of irradiation with 0.5, 1, 2, 4, 8, and 16 k.rad doses on germination rates, but higher doses, 32 and 64 k.rad, decreased the germination age and rates.

Singh (1971) concluded that gamma-rays doses of 10, 20, 30 and 40 k.rad caused a significant decrease in germination percentage of maize grains.

Marcos et al. (1972) showed that increasing the dose of gamma irradiation to 12 and 24 k.rad decreased significantly the germination percentage of barley grains. Meanwhile, 34 k.rad was completely inhibited it.

Iqbal et al. (1974) in their trails in Zea mays showed that the percent of germination increased significantly only at 5 k.rad.

Vasti and Jensen (1984) pointed out that exposing barley kernels to gamma-rays doses at a rate of 4, 6, 10 and 20 k.rad in the laboratory decreased the dry weight of top per seedling from 23.8 to 23.3, 17.2, 12.3 and 12.5 mg, respectively comparing to the control and increased the mortality ratio treatment.

2- Growth criteria :

Many investigators reported that the lower doses of gamma-rays stimulated the different growth characters of crops.

Gordon and Weber (1955), found that x-rays inactivate auxin, a plant hormone essential for growth. Auxin concentration, in turn, exerts an influence on respiratory rate, which was increased at high exposures (80 k.rad) and decreased at low exposures (5 k.rad).

Amer and Hakeem (1964) found that wheat grains exposed to gamma-rays doses 4, 7, 12, 16, 20 and 25 k.rad did not

affect significantly the growth. Whereas, Davies (1968) found that irradiation of wheat and barley grains at 1 k.rad before sowing increased growth rate, number of tillers and number of leaves/plant. Whereas, the high doses of gamma-rays decreased the above characters.

Raafat et al. (1970), Sharabash et al. (1973) evaluated the plant height of wheat plants under different doses of gamma-rays. The doses more than 7.5 k.rad decreased plant height.

The low doses of gamma irradiation, 1 k.rad or below, increased plant height, number of tillers and biological yield of barley plants (El Bastawesy and El-Masry, 1971). In the same respect, Sharabash et al. (1973) found that low doses of gamma-rays, below 1 k.rad increased the plant height, number of tillers and dry matter of wheat plants. Increasing the dose up to 10 k.rad did not affect significantly the plant height and biological yield of barley plants (Maric, 1972). Whereas, the higher doses (10-30 k.rad) decreased significantly the aforementioned parameters (Al-Kwaity et al. 1972).

Garg et al. (1972) examined the effect of pre-sowing exposure of seeds to gamma irradiation (3 k.rad) on the drought resistance and behaviour of barley plants. The plants were subjected to wilting treatments at tillering stage and were maintained so for ten days. subsequently, obser-