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

By

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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 culivars grown under drought conditions. Gamma-irridation 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 Giza121 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

List of Tables

List of Figures and Plates

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 hectars 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.

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%. Similary 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 bioligical 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 bioligical 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-