

## AN INVESTIGATION OF GAMMA-RADIATION SENSITIVITY ON *IN VITRO* STUDY OF *HORDEUM VULGARE* L.

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### ABSTRACT

Gamma-radiation sensitivity was studied on *in vitro* condition in *Hordeum vulgare* L. The variation of callusing response assessed with the increasing level of gamma-radiation treatment and regeneration delayed at higher dose level.

KEY WORDS: *Hordeum vulgare* L., gamma radiation, fresh wt., regeneration.

### INTRODUCTION

*Hordeum vulgare* L. is a very important crop in the world. It is a classical material for many fundamental studies both *in vivo* and *in vitro* condition. The effects of gamma-radiation on plant system have been periodically reported by several workers (Arya and Hildebrandt 1969, Saettler and Adams 1970, Batra and Arya 1974, Oprany 1974, Rao and Narayanaswamy 1975, Degani and Pickholtz 1980, Lin 1982, Banerjee and Chatterjee 1988), but little work has been done in the field of sensitivity of physical mutagen on callusing and regenerating properties. The present work deals with the effect of gamma-radiation on callusing and regenerating property in *Hordeum vulgare* L.

### MATERIAL AND METHODS

*Hordeum vulgare* L. was used as the experimental material. Healthy seeds of *H. vulgare* L. were treated with the increasing level of gamma radiation doses at 5 Kr, 10 Kr, 15 Kr, 20 Kr, 25 Kr, 30 Kr, from cobalt sources of Central Jute and Agricultural Research Institute, Barrackpore, West Bengal. The seeds were dehusked, immersed on 0.1% mercuric chloride for 10-12 minutes, repeatedly washed in sterile distilled water and rinsed with ethanol for 1 minute. After a change with sterile water, the scutellum was dissected out aseptically under a Zeiss binocular microscope. The scutellum tissue was cultured on Murashige and Skoog's (Murashige and Skoog 1962) nutrient agar medium supplemented with 2,4-D (2,4-dichlorophenoxy acetic acid). Besides this, casein hydrolysate and coconut water were also used. The pH was adjusted to 5.8 and the culture were kept at 24°C with 55% relative humidity. The photoperiod was maintained as 12 hours light/12 hours dark. After 5 weeks of initiation period, the culture was transferred in regenerating media.

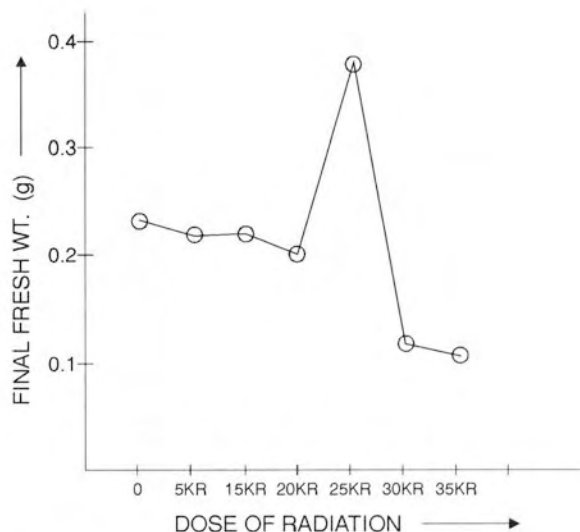


Fig. 1. Effect of radiation on the fresh wt. of the calli of *Hordeum sativum* L.

### RESULTS

MS nutrient media supplemented with 2,4-D (6 mg/l) + Casein hydrolysate (500 mg/l) was used as callus initiation media. Growth of callus was measured by the fresh wt. and it increased significantly at 20 Kr, of radiation treatment (Fig. 1). It was severely decreased with the higher dose level i.e. 25 Kr and 30 Kr, dose of radiation.

Time taken for regeneration and their percentage were also noted. MS nutrient media supplemented with 2,4-D (0.5 mg/l) + Coconut water (10%, V/V) + Casein hydrolysate (500 mg/l) exhibited almost same frequency of regeneration in all the treated and control set, but regeneration delayed at 25 Kr and 30 Kr, treatment (Fig. 2), untreated or control set along with

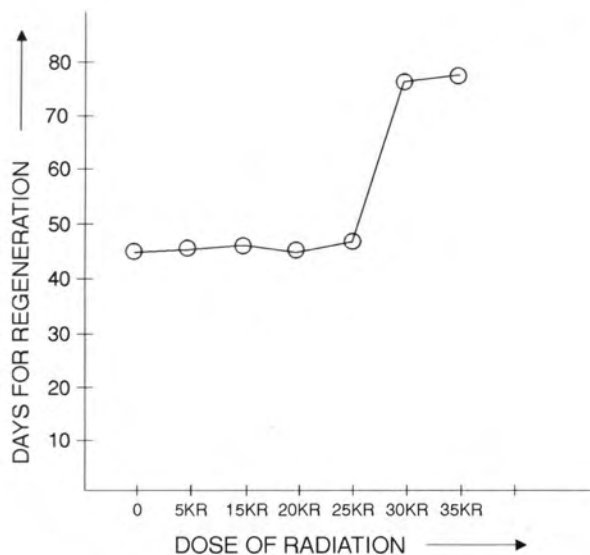


Fig. 2. Effect of radiation on regeneration percentage from the calli of *Hordeum sativum* L.

5 Kr, 10 Kr, 15 Kr, 20 Kr sets achieved whole plant formation after 47 days where it has been extended up to 77 days due to higher dose of radiation.

#### DISCUSSION

The effect of irradiation in all the cases is clearly dose dependent though no definite correlations are observed. Stimulatory effects of gamma-radiation respond good callusing at 20 Kr, but higher dose level shows inhibitory effect. In *Phaseolus*, stimulation of growth of free cells at 0.5 Kr followed by a gradual decrease with the increasing doses up to 10 Kr has been reported (Bajaj 1970, Bajaj et al. 1970). Stimulatory effect of callusing by gamma radiation also have been made in tobacco (Bar-or et al. 1973) and Shamouti Orange Spiegel and Kochba 1973) culture at 16 Kr.

Regarding the delayed regeneration phenomenon at 25 Kr and 30 Kr may be due to the temporary suppression of the differentiation of tissues. In *Vicia faba* culture, rhizogenesis occurred in treated calli after 7 months while that of non irradiated (control) set started after 15 days of inoculation (Bannerjee and Chatterjee 1988).

So, it may be inferred from the literature review and also from our investigation on the same line that plant tissues derived from different genera differ in their response in callusing as well as regeneration due to radiation treatment and a dose that is stimulatory for one species may not be so for another.

#### WRAŻLIWOŚĆ *HORDEUM VULGARE* L. NA PROMIENIOWANIE GAMMA W WARUNKACH *IN VITRO*

#### STRESZCZENIE

Wrażliwość na promieniowanie gamma badano w warunkach *in vitro* u *Hordeum vulgare* L. Zmienność powstawania kalusa i jego regeneracja opóźniały się przy wyższych dawkach promieniowania.

SŁOWA KLUCZOWE: *Hordeum vulgare* L., promieniowanie gamma, świeża masa, regeneracja.

#### ACKNOWLEDGEMENTS

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