**Table 2** *Effect of heavy metal salts on trinitrophenyl tetrazolium chloride reduction, invertase and peroxidase activity. The activities were expressed as O D. 485 10 mg$^{-1}$ pollen, µg glucose released mg$^{-1}$ protein h$^{-1}$ and ΔO D. 430 min$^{-1}$ mg$^{-1}$ protein respectively*

| Heavy metal | TTC reduction | Invertase | Peroxidase |
|---|---|---|---|
| Control | 0 17 | 270 | 0.038 |
| $Cd(NO_3)_2$ | 0.07* | 125* | 0 018* |
| $NiCl_2$ | 0 09* | 215* | 0.89* |
| $CuSO_4$ | 0.02* | 164* | 0.10* |
| $Pb(NO_3)_2$ | 0.07* | 117* | 0.22* |
| $Co(NO_3)_2$ | 0.07* | 60* | 0.07* |
| $Zn(NO_3)_2$ | 0.08* | 75* | 0.122* |

*Significantly different from control at 5% level.

(table 2). These features indicate loss of pollen viability with 150 µM $Cu^{2+}$ treatment. Inhibition of TTC reduction in the case of $Cd^{2+}$ and other heavy metal salts may reflect inhibition in pollen respiration (table 2). Bittell *et al*[10] reported inhibition of electron and energy transfer reactions in isolated corn mitochondria treated with $Pb^{2+}$, $Cd^{2+}$, $Zn^{2+}$, $Co^{2+}$ and $Ni^{2+}$. Inhibition of respiration, therefore, may be one of the factors leading to the inhibition of pollen germination and tube growth.

Acid invertase activity, which is a measure of the sucrose utilizing capacity of the system, was reduced by heavy metals (table 2). However, it is not clear whether the reduction of the enzyme activity was due to a direct interaction of metal ions with the enzyme or whether it is merely a consequence of inhibition of pollen germination and consequent reduction of carbon requirement for metabolism. Stimulation of the peroxidase activity by heavy metals indicates enhanced peroxidative metabolism (table 2). Inhibition of respiration and enhanced peroxidative activity appear to be the causative factors for heavy metal toxicity during pollen germination and tube growth.

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## POLYPLOIDY AND RADIOSENSITIVITY IN *SOLANUM AMERICANUM* MILL. AND *SOLANUM VILLOSUM* MILL.

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THE chromosome number and ploidy are the decisive factors influencing radiosensitivity of any given species[1-3]. *Solanum americanum* Mill. and *Solanum villosum* Mill. are respectively the diploid and tetraploid species which belong to *Solanum* L. section *Solanum*[4]. Although considerable data are available on the cytogenetics of these two plants[5-9], studies on their radiobiological aspects are inadequate[10]. The present study was aimed at evaluating the radioresponse of these two species in regard to morphological parameters through $R_1$ and $R_2$ generations.

Dry seeds of *S. americanum* Mill. and *S. villosum* Mill. with uniform size and moisture content were irradiated with different doses of $^{60}Co$ gamma rays. The treated seeds were sown in the field following randomized block design with three replications and the $R_1$ generation was raised. The plants of $R_1$ generation were carefully screened and the data pertaining to the effect of gamma rays on morphological parameters such as plant height, the number of branches and the number of leaves were gathered. From the seed progeny of $R_1$, the $R_2$ generation was grown and the different parameters were studied.

The results (table 1) indicate a marked stimulatory effect at most of the doses of gamma rays in regard to

**Table 1** *Effect of gamma rays on morphological characters in Solanum americanum Mill. and Solanum villosum Mill.*

| | | Mean plant height in cm | | Mean number of branches | | Mean number of leaves | |
|---|---|---|---|---|---|---|---|
| Dose | Generation | *S. americanum* | *S. villosum* | *S. americanum* | *S. villosum* | *S. americanum* | *S. villosum* |
| Control | $R_1$ | 33.33 ± 0.32 | 36.00 ± 0.35 | 4.60 ± 0.42 | 10.00 ± 0.48 | 6.00 ± 0.91 | 11.50 ± 0.43 |
| | $R_2$ | 34.50 ± 0.37 | 36.77 ± 0.39 | 5.00 ± 0.38 | 10.50 ± 0.51 | 6.20 ± 0.82 | 12.00 ± 0.55 |
| 5 kR | $R_1$ | 34.85 ± 0.61 | 42.50 ± 0.62 | 5.30 ± 0.65 | 12.00 ± 0.39 | 8.18 ± 0.69 | 13.42 ± 0.71 |
| | $R_2$ | 38.12 ± 0.55 | 43.00 ± 0.67 | 5.85 ± 0.38 | 13.00 ± 0.31 | 9.53 ± 0.72 | 13.90 ± 0.80 |
| 15 kR | $R_1$ | 45.00 ± 0.71 | 40.00 ± 0.72 | 9.75 ± 0.70 | 11.00 ± 0.50 | 12.10 ± 0.32 | 13.00 ± 0.49 |
| | $R_2$ | 48.31 ± 0.62 | 40.85 ± 0.78 | 10.00 ± 0.82 | 12.10 ± 0.59 | 13.00 ± 0.47 | 13.40 ± 0.57 |
| 25 kR | $R_1$ | 43.33 ± 0.90 | 41.00 ± 0.91 | 8.75 ± 0.27 | 13 00 ± 0.72 | 11.56 ± 0.61 | 14.00 ± 0.52 |
| | $R_2$ | 46.88 ± 0.48 | 41.75 ± 0.68 | 9.20 ± 0.32 | 13.75 ± 0.83 | 12.00 ± 0.63 | 14.40 ± 0.58 |
| 35 kR | $R_1$ | 31.66 ± 0.72 | 34.67 ± 0.57 | 5.10 ± 0.45 | 10.45 ± 0.61 | 7.70 ± 0.23 | 11.70 ± 0.71 |
| | $R_2$ | 33.72 ± 0.63 | 35.70 ± 0.62 | 5.35 ± 0.62 | 10.60 ± 0.68 | 8.00 ± 0.39 | 12.15 ± 0.34 |

± = Standard error.

all the morphological parameters in both the species. The magnitude of stimulation was relatively better in the case of *S. americanum* than *S. villosum*.

Studies on the mutagenic effects on vegetative characters of diploid and related polyploid systems are rather scanty. The effect of X-rays and fast neutrons on 2X, 4X barley and 2X, 4X and 6X wheats has earlier been studied[11]. A gradual reduction in height in 2X, 4X and 6X wheats with an increase of X-ray dosage has been recorded. An appreciable difference in the height of the diploid and tetraploid barley up to 1 kR and a gradual reduction thereafter has been indicated.

A significant variation in shoot length on account of gamma ray treatment in diploid *Phalaris* than that of tetraploid has been very well recorded[12].

The present results reveal a better range of values for all the parameters induced by gamma rays in *S. americanum* Mill. than that of *S. villosum* Mill. It can therefore be inferred that the latter species of Solanaceae has gone a long way in the course of evolution in acquiring substantial radio-resistance and tolerance than the former. The differential expression of radiosensitivity on the part of *S. villosum* Mill. could be a natural consequence of its multiple genomic make-up.

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## METHYL ISOCYANATE: A MUTAGEN

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Methyl isocyanate (MIC: $CH_3NCO$), one of the most hazardous gaseous environmental pollutants poses a serious threat to plants and animals. It is a strong/potent mutagen and carcinogen[1] affecting the taxonomic diversity and productivity of plants and causing alterations in various physiological and