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EFFECT OF HYDRAZONES ON MITOSIS IN ROOT TIPS OF *TRIGONELLA FOENUM—GRAECUM* L.

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The effect of two hydrazones namely BAHANA and SCANA was studied on mitosis in root tips of *Trigonella foenum—graecum* L. The mitotic index felldown with the gradually increasing concentrations of the hydrazones. BAHANA is more potent chemical in inducing chromosomal aberrations than SCANA.

Keywords : Hydrazone; BAHANA; SCANA; Mitotic Index; Spindle apparatus.

The hydrazones have been found to possess a broad spectrum of medicinal properties (Wilson *et al.*, 1974) and also acts as antimalarial agents (Klayman *et al.*, 1984). The hydrazones are prepared by condensing 2-aminonicotinaldehyde and appropriate acid hydrazides in 1 : 1 mole ratio in ethanol (Mogilaiah *et al.*, 1985). These compounds were evaluated for their antibacterial activity against *E. coli* (Desai *et al.*, 1984), antifungal activity against *A. niger* and *N. cressa* (Shahsafi *et al.*, 1987) and anti-inflammatory activities in albino mice of either sex (Mohan *et al.*, 1986). There seems to be no adequate information of hydrazones at the chromosomal level. In the present investigation, the effect of two hydrazones viz., benzoic acid hydrazone of 2-aminonicotinaldehyde (BAHANA) and semicarbazone of 2-aminonicotinaldehyde (SCANA) was studied on mitosis in root tips of *Trigonella foenum-graecum* L.

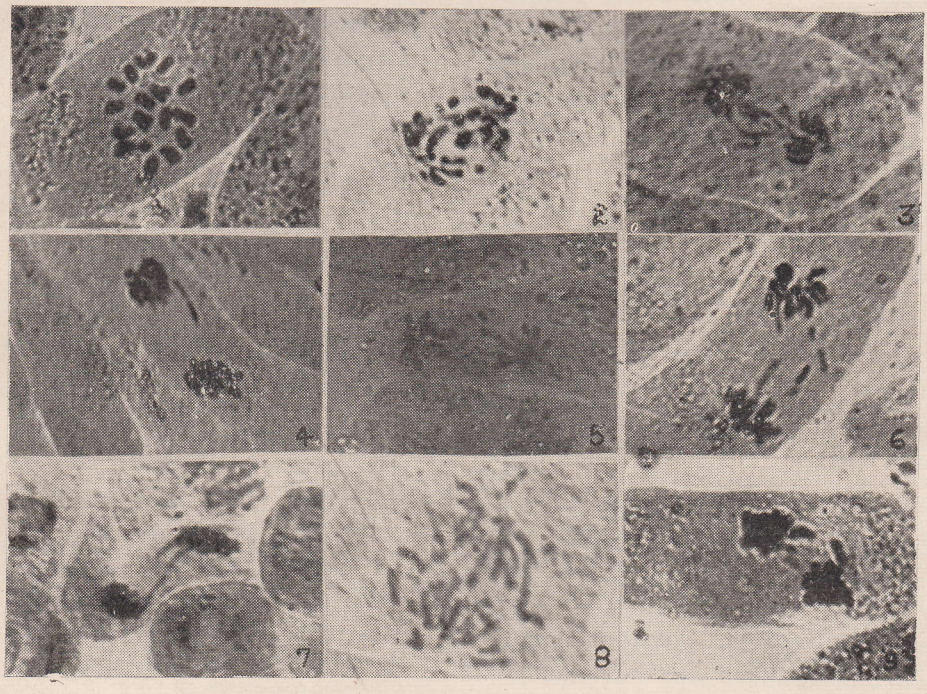
Actively growing seedlings of *Trigonella foenum-graecum* were treated with 0.01%, 0.02% and 0.03% concentrations of BAHANA and SCANA for 4 hr. Required concentrations were prepared in ethanol as the compounds did not dissolve in distilled water. Seedlings treated with ethanol were used as control. After 4 hr. the seedlings were taken out and washed thoroughly with distilled water. The root tips of the treated seedlings and the controls were fixed in 1:3 acetic alcohol.

Table 1. Frequency of various type of abnormalities at different stages of mitosis induced by BAHANAand SCANA (Frequencies are expressed on the percentage of total number of cells examined in each case)

Conc. of comp-ounds	Total number of cells examined	Pro-phase	Mataphase				Anaphase				Telophase			Mitotic index
			Nor-mal	Disturbed spindle organi-zation	Sticki-ness	Total	Nor-mal	Bri-dges	Lag-gards	Preco-cious move-ment	Total	Nor-mal	Micro nuclei	Total	
Control	470	2.9	2.1	—	—	2.1	3.2	—	—	—	3.2	2.8	0.1	2.9	22.5
BAHANA															
0.01%	450	2.1	2.2	2.1	3.1	7.4	3.8	1.1	2.6	1.8	9.3	3.8	0.9	4.7	19.8
0.02%	375	3.3	2.6	2.4	3.2	8.2	4.0	0.2	2.9	1.0	8.1	2.6	1.1	3.7	18.0
0.03%	420	2.3	2.7	2.8	2.9	8.4	3.6	0.9	3.1	0.9	8.5	2.0	1.3	3.3	17.3
SCANA															
0.01%	419	2.0	2.0	1.9	3.0	6.9	2.8	0.8	1.0	1.2	5.8	3.1	1.0	4.1	16.9
0.02%	469	2.6	1.9	2.0	3.6	7.5	3.6	0.2	2.3	1.1	7.2	2.9	0.9	3.8	12.3
0.03%	397	2.3	1.7	2.2	3.9	7.8	4.2	0.1	2.4	0.6	7.3	2.7	0.6	3.3	10.9

Cytological preparations were made by using 2% aceto-orcein. Various mitotic irregularities were observed and recorded in Table 1.

It is apparent from results that the hydrazones namely BAHANA and SCANA are highly effective in inducing the chromosome alterations in the meristematic root cells of *Trigonella foenum-graecum*. The data presented in Table 1, show that the mitotic index is lower in treated roots compared to the control and it decreases with the increasing concentrat-



Figures 1–9. Induced mitotic aberrations in *Trigonella foenum-graecum* ×3000.

Fig.1—Control metaphase shown 2n=16 chromosomes. Effects of BAHANA (Conc. 0.01 & 0.2%); Fig. 2—Disturbed anaphase with sticky chromosomes; Fig. 3—Anaphase with laggards and fragments; Fig. 4—Early telophase with a laggard; Fig. 5—Late anaphase with fragments. Effects of SCANA (Conc. 0.02 & 0.03%); Fig. 6—Late anaphase with laggards and fragments; Fig. 7—Telophase with broken bridge and two laggards; Fig. 8—Disturbed anaphase; Fig. 9—Telophase with laggards and fragments.

ion. The spectrum of cellular responses included scattering of chromosomes at anaphase (Fig. 8) and the treatment with higher concentrations of compound namely 0 02% and 0.03% yielded stickness and chumping of chromosomes (Fig. 2). Spectrum of anomalies also includes broken bridge and laggards at anaphase (Fig. 4) and telophase (Fig. 7). The most striking feature noticed in nearly all treatments was the production of laggards and fragments at anaphase and telophase (Figs. 3, 5, 6 & 9). In general, the BAHANA is more potent mutagen than SCANA in inducing chromosomal aberrations.

The present observations revealed that these compounds possess mutagenic activity because they are the derivatives of hydrazine (HZ), a base specific chemical. These compounds may directly acts on thyamine and brings about mutations. The inhibiting action of BAHANA and SCANA on mitosis included inhibition of cell division, spindle apparatus and cell wall development. This inhibitory effect may be due to the blockage of DNA synthesis (Heiner, 1971). The spindle anamolies induced by BAHANA and SCANA are due to the disturbances of spindle apparatus. In general the spindle inhibiting effect of the compounds resemble the spindle inhibiting action caused by other C-mitotic agents (Deysson 1975). Regarding the possible mechanism of action on chromosomes, it is probable that it might be disturbing the nucleic acid metabolism resulting in hazards in protein reduplication causing the chromosomes to break at different loci (Kihlman, 1966).

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