Table 1 *Azotobacter population as influenced by some soil properties*

Soil	pH	EC mmhos/cm	Azotobacter population/g ($\times 10^3$)	Organic carbon (%)	Total nitrogen (%)	Exchangebale cations (meq/100 g)			
						NA	K	Ca	Mg
Acid soil (Sirsi)	5.60	0.04	6.00	0.94	0.09	0.38	0.15	11.4	5.4
Forest soil (Prabhunagar)	6.30	0.04	84.00	2.58	0.24	0.91	0.17	29.4	8.6
Red soil (Dharwad)	7.30	0.17	29.50	0.46	0.04	0.31	0.18	14.2	4.4
Black soil (Dharwad)	7.55	0.13	65.50	1.20	0.01	0.23	0.06	25.4	9.0
Salt-affected soil (Hooli)	8.10	5.44	8.00	1.10	0.01	21.30	0.24	1.4	0.8

Table 2 *Association of Azotobacter population with some soil properties*

pH	−0.049
EC mmhos/cm	−0.492
Organic carbon (%)	0.724*
Total nitrogen (%)	0.555
Sodium (meq/100 g)	−0.477
Potassium (meq/100 g)	−0.478
Calcium (meq/100 g)	0.939**
Magnesium (meq/100 g)	0.838**

*Significant at 5%; **Significant at 1%.

Table 2 indicates significant correlation between calcium and magnesium versus Azotobacter population but the trend is not definite.

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HAEMATOLOGICAL CHANGES IN INDIAN DESERT GERBILS (*MERIONES HURRIANAE*, JERDON) FED WITH MAIZE DIETS CONTAINING ORGANIC ACIDS

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THE antimicrobial food additives such as sorbic acid and acetic acid have been generally recognized as safe (GRAS) by the Food and Drug Administration. As sorbic acid is known to possess the properties of low mammalian toxicity[1], it has been approved by the environmental protection agency for use in whole grains and other raw agricultural commodities[2]. A large number of feeding trials on albino rats have been carried out with feeds containing acetic acid, propionic acid and sorbic acid[1,3-5]. However, since these organic acids have not been evaluated for their haematotoxic potential in the Indian desert gerbils, an attempt was made to study the effect of acetic acid and sorbic acid on the blood parameters of weaning gerbils.

Indian desert gerbils (*Meriones hurrianae*, Jerdon) were bred in captivity in the animal house of CFTRI. Four-week-old, 18 male and 18 female gerbils weighing 47-60 g were selected and grouped randomly with 6 males and 6 females in a group. Freshly harvested maize was partly broken in a laboratory mill and was then treated with the organic acids, viz., sorbic and acetic at 1% level. The first group received maize diets without any acid treatment. The second group was fed with maize treated with acetic

Table 1 *Haematological changes in weaning Indian desert gerbils fed with maize diets containing acetic acid and sorbic acid for four weeks*

Sex and dietary level %	Hb g/dl	WBC/μl	Differential count (%)		
			Lymphocytes	Neutrophils	Monocytes
Control					
Male	14.0 ± 0.20	9,062 ± 809	84.5 ± 5.25	14.0 ± 5.11	0.25 ± 0.25
Female	13.25 ± 0.14	4,987 ± 481	73.0 ± 1.22	15.25 ± 1.31	1.75 ± 0.47
1% Acetic acid					
Male	13.12 ± 0.31	4,950 ± 1229*	83.25 ± 2.56	15.25 ± 2.42	1.50 ± 0.58
Female	12.62 ± 0.23	4,187 ± 508	81.75 ± 1.31*	17.75 ± 1.31	—
1% Sorbic acid					
Male	12.62 ± 0.62	7,162 ± 1086	80.0 ± 3.63	19.25 ± 3.56	0.75 ± 0.25
Female	13.0 ± 0.20	5,662 ± 1151	84.75 ± 3.47*	14.75 ± 3.56*	0.50 ± 0.28

Values are mean ± SE of four animals; *values are significantly different over respective controls when subjected to Student's *t* test at $P < 0.05$ (at 5% level).

acid while the third group received maize diets treated with sorbic acid. The animals were caged individually with free access to water and the diets were fed *ad libitum* for four weeks. The daily food consumption and growth were monitored at weekly intervals.

The rats after four weeks were killed under light anaesthesia and blood was drawn by cardiac puncture into tubes containing EDTA for haemoglobin (Hb), white blood cells (WBC) and differential counts. The counts were made by standard techniques[6].

None of the gerbils of the experimental group exhibited any symptoms during the four week study. Food consumption was normal and there were no significant differences in the gain of the body weight between the controls and the treated gerbils. However, organic acids induced slight alterations in the haematological parameters (table 1). There was a marked decrease in the total leukocyte counts. There was a statistically significant ($P < 0.05$) increase in the lymphocytes accompanied by statistically significant decrease ($P < 0.05$) in the neutrophils of the female gerbils of the experimental groups. Though there was a slight decrease in the lymphocytes of the male gerbils fed with organic acid treated maize, the data obtained were not statistically different from that of the controls. There were no alterations in the haemoglobin content. The present results suggest that the organic acids could suppress the immunological responses of the male gerbils as reflected by the decreased count of the lymphocytes. The increase in the lymphocytes could be attributed to the induction of some pathological changes which could not be confirmed in this study. Such changes in albino rats have been reported with mycotoxins and pesticides[7-9]. The decrease in the neutrophil count might be related to the response of infectious agents or xenobiotics in the host environment as postulated by Wintrobe[10]. However, the exact mechanism by which the effect on blood parameters was exerted is not known.

The results indicated that the weaning gerbils were highly susceptible to the dietary organic acids as they possessed a certain degree of haematotoxic potential. Further studies are in progress.

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KARYOTYPE ANALYSIS IN DIFFERENT VARIETIES OF *CORIANDRUM SATIVUM* L.

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CORIANDRUM SATIVUM L. commonly known as coriander is widely cultivated because of its economic importance. A few reports[1–3] revealed that the diploid chromosome number $2n=22$. The present investigation was taken up in view of the scanty data on cytology of the varieties of the species.

The 8 varieties, namely, *C. sativum* var. KMU 27, Sutton 1678, KBI 1626, KBI 1627, Punjab dwarf, UDI, UD 41 and Chelsea 122 were collected from the Sutton Seed Nursery, Calcutta and from different institutes of USSR, Leipzig and London.

Somatic chromosomes were studied from root tip cells following 2% aceto-orcein staining after pretreatment and fixation in saturated paradichlorobenzene and aesculine solution, and 1:3 acetic ethanol mixture, respectively. Prior to staining a cold hydrolysis of fixed root tips in 5N HCl for 7 min was done.

In the present investigation karyotype analyses of 8 varieties of coriander were carried out. All of them showed $2n=22$ chromosomes and, in general, the chromosomes were of medium to short size. The chromosomes can be distinguished into 7 types (figure 1) according to their length and the position of the constrictions of the chromosomes. Only in the var. UD1 one pair of supernumerary constricted chromosomes of type D were observed, which is a common characteristic feature of some umbelliferous species[2]. Secondary constricted chromosomes varied from 4 to 8 in number. F type (submedian) of chromosomes were present in all the varieties. The absence of A (secondary constricted chromosomes with submedian and subterminal constrictions) and G (median) type of chromosomes was noted in UD1. Perhaps, 4 chromosomes, each of A and G type of var. Sutton 1678, were involved in the D and F types of chromosome production. The detailed karyotype analysis (table 1, figures 2–9 and 2a–9a) showed a gross morphological similarity in the complements, though cryptic structural details distinguish their genetic drift among the varieties. In the different varieties of coriander the TF% values ranged from 17.46% in KMU 27 to 30.08% in KBI 1627 (table 1). The variation in chromosome size in a complement, as noted in TF% values, depends mainly on genetically controlled coiling or uncoiling of the chromosome arms[4]. Detailed chromosomal analyses indicated minute differences in karyotypes among varieties; this may indicate the importance of structural alteration of chromosomes in evolution[5,6]. It is suggested that the micro-evolution of genomic constituents or changes of unique sequences of genes are responsible for synthesis/origin of new varieties.

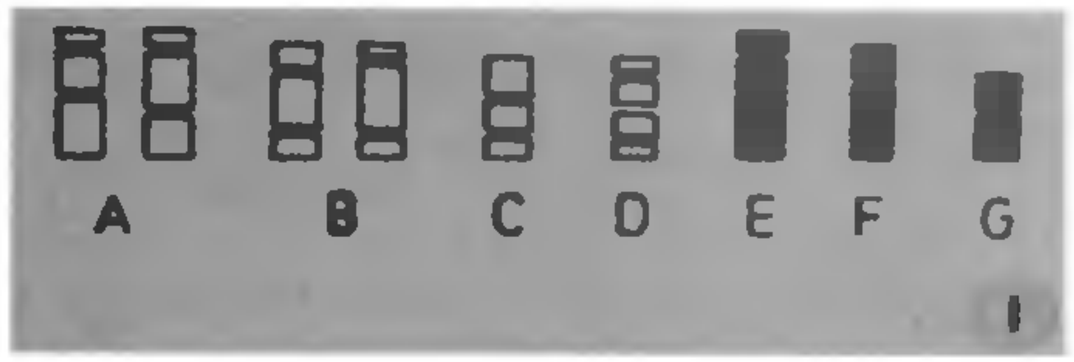

Figure 1. Diagrammatic representation of common chromosome types present in 8 varieties of *C. sativum* L.

Table 1 *Comparison of karyotypes of the varieties of C. sativum L.*

Varieties ($2n=22$)	Karyotype formulae	No. of chromosomes bearing secondary constrictions	TF%	Range of chromosome length (μm)
KMU 27	$A_4B_2E_{12}F_4$	6	17.46	3.61 6.70
Punjab dwarf	$A_4C_4E_4F_{10}$	8	23.31	2.58 3.61
Sutton 1678	$B_6C_2F_{10}G_4$	8	23.86	2.06 3.61
KBI 1626	$A_2B_2E_2F_{14}G_2$	4	23.90	2.32 3.35
Chelsea 122	$A_2B_2E_4F_{14}$	4	24.32	2.06-3.61
UD 41	$B_2C_2E_2F_{14}G_2$	4	27.45	1.54 3.34
UD I	$B_2C_2D_2F_{16}$	6	28.34	2.58 3.09
KBI 1627	$A_4C_2F_{12}G_4$	6	30.08	2.58 3.61