in plan, exhibit polygonal shapes, measuring from 5 cm to 15 cm across (Fig. 1). These dykelets

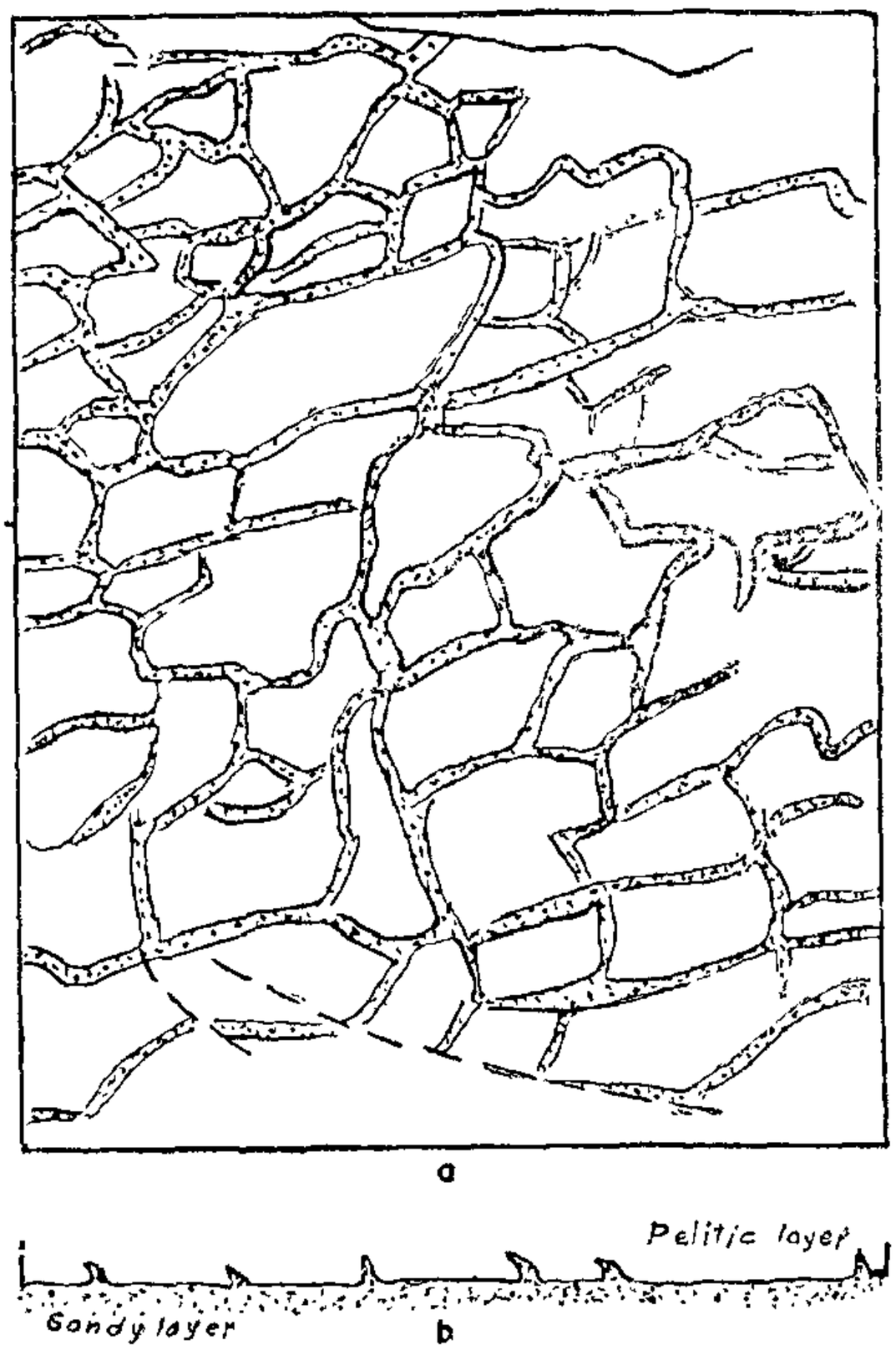

FIG. 1. Sand polygons in plan (*a*) and Section (*b*). Scale : 1 cm = 5 m. app.

punctuate the lithological homogeneity and stratification of the pelitic layers, providing superficial resemblance to mudcracks. The sand dykelets are in structural disharmony to the stratification and compositionally resemble the sandy layers lying below the pelitic layers, suggesting that these dykelets are part of the same sedimentary sequence. The sandy layer occurs below the pelitic layer at outcrop level in the normal order of superposition. Sand polygons are common towards the lower bedding plane of the pelitic layer. In the true mudcracks, formed by desiccation, the development of cracks is vertical to the bedding plane and the fractures open towards the top. In the structures under discussion, the fractures are opening towards the bottom and the sandy material is seen cutting across the bedding plane in the pelitic layers at angles varying from 20° to 40° and at places vertical.

Dzulynski and Walton[4] have considered the development of pseudo-mudcracks and sand polygons as due to the expansion of liquified sandy layer horizontally, without comparable expansion in the fine grained pelitic layer. This differential expansion would lead to the development of polygonal tension cracks in the fine grained layer. The liquification of the sandy layer may possibly be attributed to seismic shocks in the tectonically unstable depositional environment of the Aravalli Supergroup[5]. The polygonal fractures in the fine grained layers would be filled up by the injection of the sand material from the underlying sandy layer under super-incumbent load.

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STUDY OF THE KARYOTYPE, REPORT OF B-CHROMOSOMES AND POLYTENE CHROMOSOMES IN *PHASEOLUS AUREUS* ROXB.

INITIAL report on somatic chromosome behaviour in *Phaseolus aureus* Roxb. has been published already[1]. In the present note some detailed account on this aspect is described. Perusal of literature[2,3] reveals that the karyotype study in this taxon is not satisfactory. This may be due to smallness of chromosomes, their more or less similar size and lack of suitable pretreatment schedule to reveal the constrictions of individual chromosomes. Moreover, the B-chromosomes and polytene chromosomes are found in the root tip meristem and its adjoining areas following a special methodology of chromosome preparations.

For a critical study of the karyotype, different pretreating chemicals were used, among which saturated solution of α-bromonaphthalene for 3 hours at 6° C was found suitable. Healthy young roots were taken from the seedlings of *Ph. aureus*. Fixation was done in acetic acid and alcohol mixture (1 : 3) for

half an hour followed by washing in alcohol grades (90%, 70%) and lastly in distilled water for 15 minutes each. They were macerated in 2% pectinase at 40° C for one hour. This was followed by 45% acetic acid for 5 minutes and then stained overnight in 2% aceto-orcein or after squashing staining was done with 2% Giemsa.

The meristematic cells of the root tip region shows $2n = 22$ diploid chromosomes (A) ranging between 1–3 μm and B-chromosomes which vary from cell to cell (0–7), range between 0·4–1 μm (Fig. 1). Polyploidy (triploidy, tetraploidy or more, Fig. 2) has been also found in the older part of the meristematic region. B-chromosomes are isopycnotic as well as heteropycnotic and relate to A-chromosomes. Hence the actual number varies and was overlooked[5]. From a number of metaphase plates, it appears that the karyotype consists of 6 pairs of submetacentric chromosomes (Fig. 3, 1–6), 5 pairs of metacentric chromosomes (Fig. 3, 7–11) and B-chromosomes which may be either metacentric or with apparently no constriction (rod types, Fig. 3, B, B). Secondary constrictions or satellites are not found as reported previously[2,3]. The karyotype formula may be written as S6 + M5 + B (1–7), S denoting the submedianly constricted chromosomes, M metacentric ones and B the Bs.

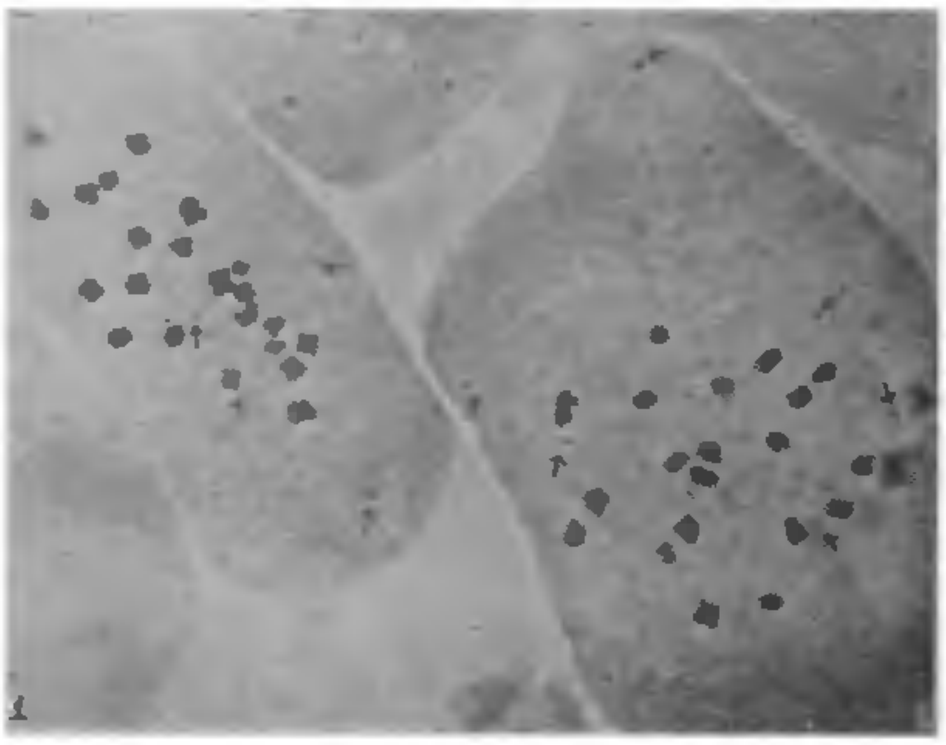


FIG. 1. Metaphase plates showing Autosomes and B-chromosomes (arrowed) in the root-tip meristem of *Phaseolus aureus*.

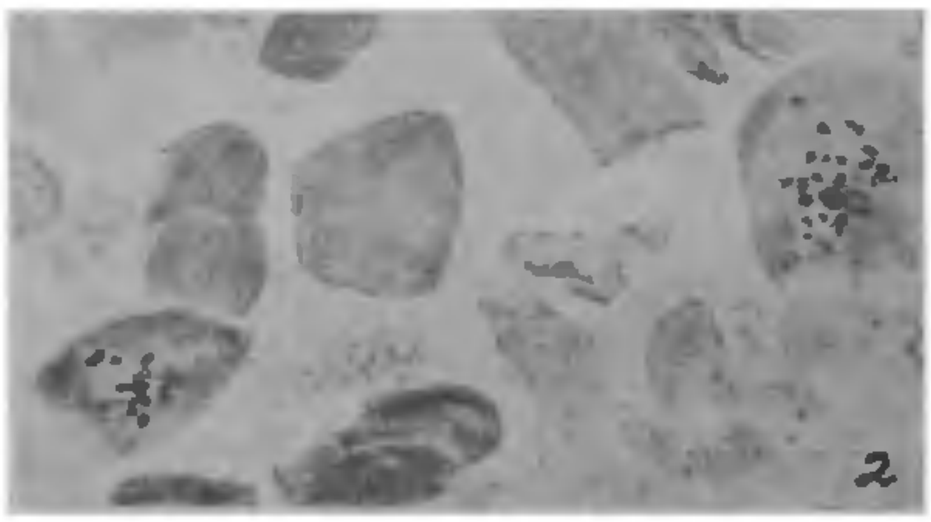


FIG. 2. Diploid and polyploid metaphase cells in the root-tip tissue of *Ph. aureus*.

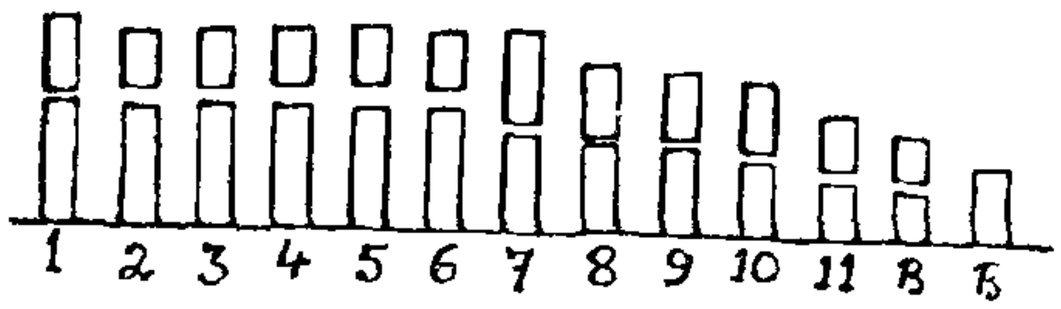
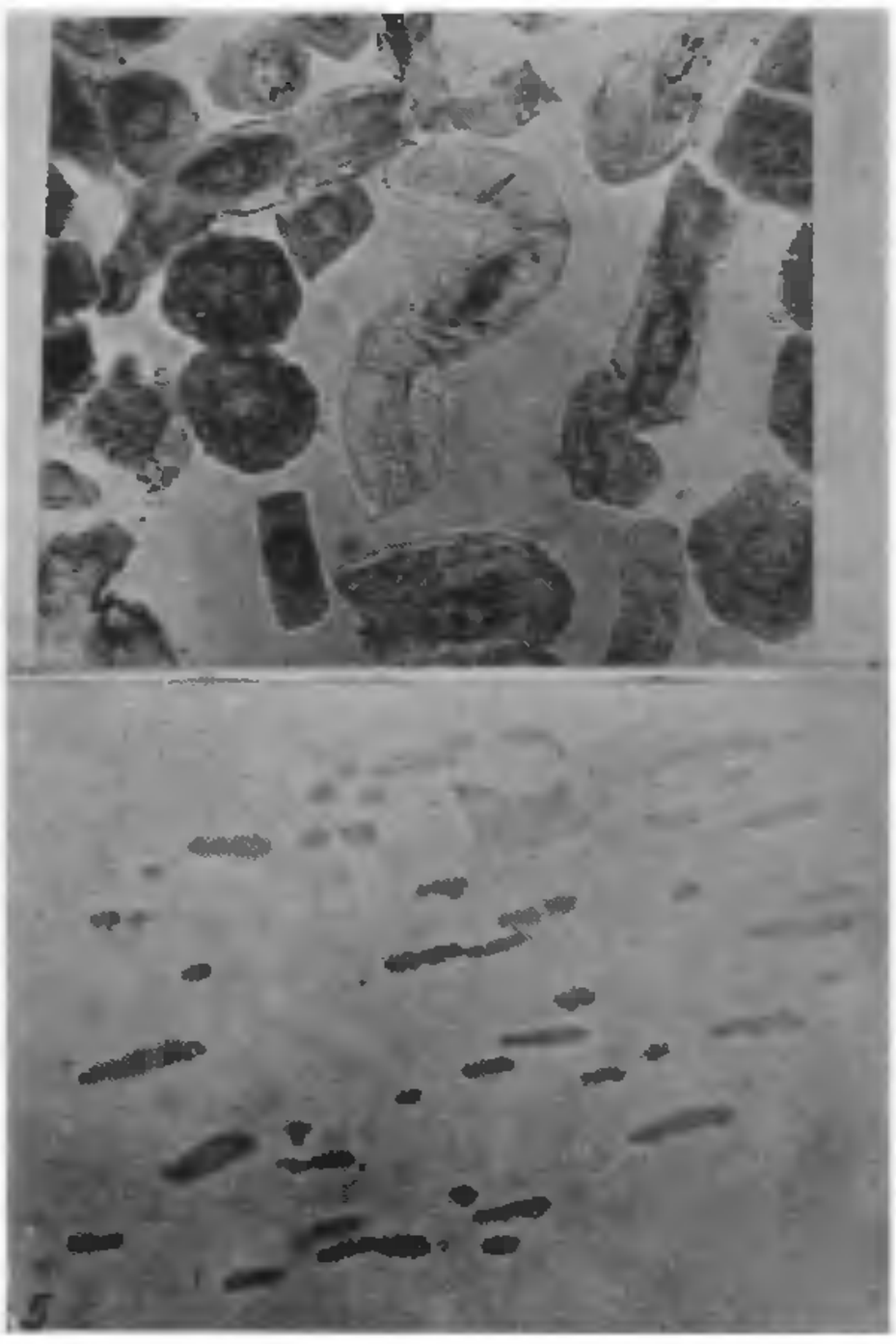


FIG. 3. Idiogram showing the different types of somatic chromosomes found in *Ph. aureus*.

The polytene chromosomes are found in the endopolyploid cells adjacent to the meristem as reported already in *Ph. vulgaris*[4]. They arise through endomitosis. They are in prophase stage and hence their morphology is not clear[6]. The number, length and breadth of these chromosomes vary according to the degree of polyteny and ploidy level (Figs. 4, 5).



FIGS. 4–5. Endopolyploid cells and polytene chromosomes respectively found adjacent to the meristematic region in the root of *Ph. aureus*.

This account indicates that the *Ph. aureus* is not only important from the economic point of view but from cytological aspect as well. Seed sterility which is often encountered by different workers (including the present author) (about 27·2%) may be due to the presence of B-chromosomes which were not detected earlier.

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INFLUENCE OF KINETIN AND MORPHACTIN ON ^{14}C INCORPORATION INTO ALCOHOL SOLUBLE AND INSOLUBLE SUBSTANCES DURING FEMINIZATION OF CASTOR (*RICINUS COMMUNIS* L.)

INDUCTION of feminization has been reported by treatment with cytokinins in *Vitis vinefera*[1] and *Ricinus communis*[2] and in several other plants. It has been demonstrated that morphactin significantly affects sex expression in some cucurbits such as *Cucumis sativus*[3] and *Luffa acutangula*[4], in *Cannabis sativum*[5] and *Sesamum*[6]. However, the mechanism by which morphactin modifies sex expression remains obscure[7]. The present study has been designed to understand the physiological basis of modification of sex expression by morphactin and kinetin with particular reference to ^{14}C incorporation into alcohol soluble and insoluble substances.

Ricinus communis L. var. Aruna, a radiation-induced mutant developed from HC–6 was selected for this study. Kinetin (6-furfurylaminopurine) and morphactin EMD 7301W (methyl ester of chlorofluerenol) have been used at a concentration of 20 ppm each as this concentration was found effective in increasing femaleness. The aqueous solutions of the chemicals with 0·01% wetting agent (Tween–20) were sprayed at stages 3 and 4 (vegetative stages) to the stem tips and fully expanded upper leaves. $^{14}CO_2$ was fed to fully matured intact leaf, just below the terminal bud, at fifth (vegetative) and sixth (reproductive) stages. The experiment was intended to study the rate of $^{14}CO_2$ incorporation, into the fed leaf and the translocation of substances to the shoot tip, lower leaf, stem and root systems, immediately after feeding and 24 h after feeding. Fifty μ ci of ^{14}C sodium bicarbonate (sp. activity 56·7 m ci/m mole) was taken and $^{14}CO_2$ was generated by injecting 2 ml of 2N HCl into the setup. ^{14}C incorporated into alcohol soluble and insoluble substances was estimated as cpm/g fresh weight according to the method of Atkins and Canvin[8].

The pistillate to staminate ratio was as follows—control 1:4·75; kinetin 1 : 1·6; and morphactin 1:3·29. With morphactin treatment the reduction in maleness was only 3% but the increase in femaleness was 40%. As opposed to this behaviour, kinetin reduced the maleness to 40% and increased the femaleness to 78% (Table I). Bisaria[9] working with *Luffa acutangula* observed that morphactin increased the production of pistillate as well as staminate flowers up to a concentration of 100 ppm. Krishnamoorthy[10] in his studies with morphactin on sex expression of *Luffa acutangula* observed that the ratio of female to male was 1:10·6 in control while it was 1:44·4 with morphactin. In this respect morphactin resembles gibberellin in promoting male tendency. Thus it appears that morphactin produces different effects in different plants. ^{14}C incorporation soon after feeding into soluble and insoluble substances was high in the leaf compared to the shoot tip during vegetative stage. 24 h after feeding, incorporation into soluble fraction was more in the shoot tip and was considerably less in the fed leaf, the lower leaf and the root indicating that there was upward translocation of soluble substances. ^{14}C incorporation into insoluble fraction in the shoot tip was also high 24 h after feeding with a concomitant increase in stem and root. More feminization caused by kinetin and morphactin (Tables IIA and IIB) increased the ^{14}C incorporation both into

TABLE I

Effect of kinetin and morphactin on changes in sex expression

(Mean of ten replications)

	Control	Kinetin	Morphactin
Female flowers	32	57 (78)	45 (40)
Male flowers	152	92 (−40)	148 (−3·0)
Ratio of female/male	1 : 4·75	1 : 1·61	1 : 3·29

Note—The figures in the parenthesis represent percentage increase or decrease (−) over control.

	Female flowers	Male flowers
F. calculated	23·11*	31·14*
C.D. at 5% level	7·53	17·56

* Significant at P = 0·05.