quantitative measure (e.g. to find out the earliest separating chromosomes one needs cells with only 2 to 3 separated chromosomes); e) there might exist polymorphism for the sequence in our species and f) constitutive heterochromatin or some satellite DNA might control sequential separation. Fraction IV of SAT-DNA[7] is common to all late separating acrocentric chromosomes. Also, with the exception of Y, the NOR regions are located on these chromosomes.

Vicia faba (broad bean) root tips. In ACB karyotype of *Vicia faba*[8] all pairs of chromosomes can be identified without banding. The secondary roots treated with 0.05% colchicine for 4 h were kept in running tap water for 30 min to 1 h to release the metaphase block. A sample of 1800 chromosomes (150 cells) stained with acetocarmine showed chromosome No. 5 to be the most frequently separated. No. 5 constituted 98% of the population (100 cells) with only 1 or 2 chromosomes showing separation, and the 2 homologues showed 80% synchrony of separation. Figure b gives the sequence of separation. It also shows that: a) chromosome No. 4 is the last one to separate, b) No. 6 is the next to last and c) chromosome Nos 1, 2, and 3 all separate almost simultaneously.

The mitotic cells of crepis capillaris. Crepis capillaris (compositae) has 3 pairs of identifiable chromosomes. Preparation was made as for *Vicia faba.* In a sample of 140 cells analyzed, the most frequently separated chromosome was No. 1. No. 2, was second in separation and in close proximity to No. 3. Relative centromere distances index for the genome is shown in figure c.

Possible existence of synchrony and polymorphism. If one takes a sample of 2 pairs of chromosomes some distance apart on the spectrum of centromere separation, one observes that homologues almost always separate closer to each other in time than non homologues. This has been observed for 100 pairs of chromosome No. 2 vs any pair belonging to group D in man. Thus, homologues may have a common genetic element controlling the time of separation; this suggests the existence of synchrony. However, in one individual showing heteromorphism for the amount of constitutive heterochromatin in pair No. 1, the one with large C-chromatin block expressed a somewhat delayed separation in 44 chromosomes compared to only 6 in the one with small C-chromatin block. These data point to the existence of polymorphism; but are not sufficient to elucidate the role of centromeric-heterochromatin in centromere separation. Similarly, earlier separation of chromosome 2 in Méhes' studies[6] (compared to ours) may indicate possible polymorphism for this, and possibly other, chromosomes.

The degree of apparent synchronous separation (same value for the homologues) in *C. capillaris* was lower (40%) for the earliest separating chromosome (No. 1) than for the earliest separating chromosome (No. 5) in *V. faba* (81%). Such differences might be useful in study of control of separation. Since the data were compiled for several root tips without regard to their genetic homogeneity, possiblity exists that in crossfertilized *C. capillaris* the genetic heterogeneity for the element(s) controlling centromere separation is far greater than that for selfertilized *V. faba.*

Possible significance of sequential centromere separation. The idea that sister chromatids in a metaphase-anaphase cell separate at the centromere in a non-random, predetermined fashion has limited literature available. We do not know if the phenomenon is genetically controlled, if centromeric heterochromatin or any fraction of it is involved in the control, if sequences exhibit polymorphism and if it has any bearing on mitotic and meiotic II non-disjunction. It is of interest that in trisomic 18 individuals and their mothers chromosome 18 is not the earliest to separate as seen in normal population[6].

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Soluble hepatic lectin in regenerating liver

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Summary. Similar activity of a soluble hepatic lectin was measured in regenerating rat liver 12 h following partial hepatectomy or gentle manipulation. Lectin response seems to be related to trauma rather than cell proliferation.

Of the hepatic lectins described, several are membrane bound, but one seems to be primarily intracellular. The membrane bound hepatic binding glycoprotein of Ashwell and Morell requires calcium for binding and carries a specificity directed towards B-galactose[1]. The lectin, composed of 2 subunits with mol. wts of 40,000 and 48,000 daltons, may function in the clearance at desialyated glycoproteins[2]. A 2nd carbohydrate binding lectin, isolated from bovine liver plasma membrane, has not yet been fully characterized[3] although like the previous glycoprotein, it is solubilized with detergents. Several other hepatic lectins have been described mainly by their saccharide binding properties[4,5]. We chose to study an intracellular hepatic lectin, with binding specificity to lactose or thiodigalactoside. It has been isolated previously from neonatal rat brain[6], and embryonic muscle[7]. This lectin is soluble and does not require calcium ions for agglutination. A role in embryonic development has been postulated for the lectin in brain and muscle muscle. However, studies with embryonic liver shows this lectin is not involved in hepatic differentiation[8,9].

Methods. 43 male Sprague-Dawley rats (200 mg) were subjected to 70% hepatectomy[10]. 23 rats underwent a sham operation with gentle manipulation of the liver. After sacrifice at timed intervals, lectin extract was prepared as described by Nowak et al.[7]. Livers were homogenized in phosphate buffered saline with 4 mM-mercaptoethanol, 2 mM EDTA and 0.3 M lactose, pH 7.2. Following centrifugation $\times 35{,}000$ for 3 h 15 min, supernates were dialyzed exhaustively against a lactose free extraction buffer. Lectin activity was determined by the hemagglutination method of Nowak et al.[7] using trypsin-treated, gluteraldehyde fixed

rabbit red blood cells. Specificity was checked by inhibition with 0.3 M lactose.

Results. Hepatic lectin activity rose after partial hepatectomy and sham operation with manipulation of the liver by 12 h, peeked at 24–72 h, and declined by 144 h (table). Similar hemagglutination titers were obtained for both procedures, and in each instance values were inhibited by greater than 50% with 0.3 M lactose. The results suggest the lectin response correlates better with trauma than with cell proliferation since no difference in the lectin activity appeared between weak and strong regenerative stimulus. The function of the soluble hepatic lectin is not known. A possible explanation of our data lies in the recent identification of acute phase proteins with lectin properties[11,12], and the finding of soluble hepatic lectin in Kupffer cells[8]. The lectin may be related to the acute phase protein synthesized or released by the Kupffer cells in response to trauma.

Hepatic lectin in regenerating liver

Hours post surgery	Partial hepatectomy	Sham operated
6	72±10	57±16
12	477±157	641±95
24	550±50	492±103
48	422±82	-
72	442±51	600±138
144	23±4	47±17
192	53±15	69±51
Pre-hepatectomy liver 57±23		

Values are expressed as mean±SEM, hemagglutination titer^{-1}/mg protein.

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Response of maize to different inoculum densities of vesicular arbuscular mycorrhizal endophytes

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Summary. The effect of the inoculum density of vesicular arbuscular mycorrhizal endophytes on growth and development in maize was investigated in sterilized soil under glass-house conditions. Mycorrhizal plants grew robust and produced three times more dry weight than non-mycorrhizal plants. 40 or more endophytes per plant produced the highest mycorrhizal association and the maximum growth in maize. The uninoculated plants exhibited the symptoms of chlorosis.

Vesicular arbuscular mycorrhiza (VAM) may markedly influence the growth of the host plant[1] in a soil with low available phosphorus. Such increases are more noticeable in irradiated soil than unsterilized soil[2]. This may be ascribed to there being less microbial competition, and to other nutrient factors. In certain cases the plants lacking mycorrhiza may not survive[3]. The VAM has been widely exploited in the uptake of phosphorus from P-deficient soils[4–7]. To find a suitable inoculum, different levels of endophyte inoculum were tested for their effectiveness on growth and development in maize plants.

Methods. Sterilized maize seeds were germinated in sterilized moist chambers and these seedlings were transplanted (2-cm-long radicle stage) into pots (11 cm × 13 cm) filled with steam sterilized soil (pH 5.8, available phosphorus 0.03%, organic matter 3.2%, nitrogen 0.03% and potassium 2.4%). 5 maize plants were transplanted into each pot. The pots were subsequently inoculated with VAM endophytes (*Glomus* sp.) at different inoculum levels (2, 4, 16, 40 and 60 spores per plant). The uninoculated plants received doubly-sieved soil containing the soil microflora without any mycorrhizal propagules[8].

Growth of maize plants was measured (stem height, leaf number) on 20, 35 and 60 days after transplanting maize seedlings into pots. The shoot dry weight and mycorrhizal association were also recorded at these harvestings. Mycorrhiza was assessed by technique of Phillips and Hayman[9]. The percentage of infected roots was calculated using the roots which either possessed vesicles, arbuscule or both.

Results and discussion. Significant variation was observed in growth and development of mycorrhizal and nonmycorrhizal plants (table 1). At the 1st harvest (20 days) insignifi-

Table 1. Production of shoot dry weight, leaf number and stem height in relation to inoculum density

Spore number inoculated	Dry weight (g) I	II	III	F-value	Leaf number I	II	III	F-value	Stem height (cm) I	II	III	F-value
2	76.6	203.3	268.7	11.05**	3	6	11	37.47**	16.9	38.9	59.8	17.39**
4	70.0	193.3	265.8		4	7	12		21.8	36.4	57.8	
16	96.7	263.3	419.5		4	7	12		23.9	44.8	64.2	
40	104.3	356.6	578.4		4	8	13		25.8	53.03	74.4	
60	143.3	396.6	610.5		5	8	14		37.7	75.8	98.3	
Control	46.6	120.0	210.4		3	5	7		16.6	38.06	49.4	

I, 1st harvesting; II, 2nd harvesting; III, 3rd harvesting; F-value of analysis of variance; ** significant at 1% level.