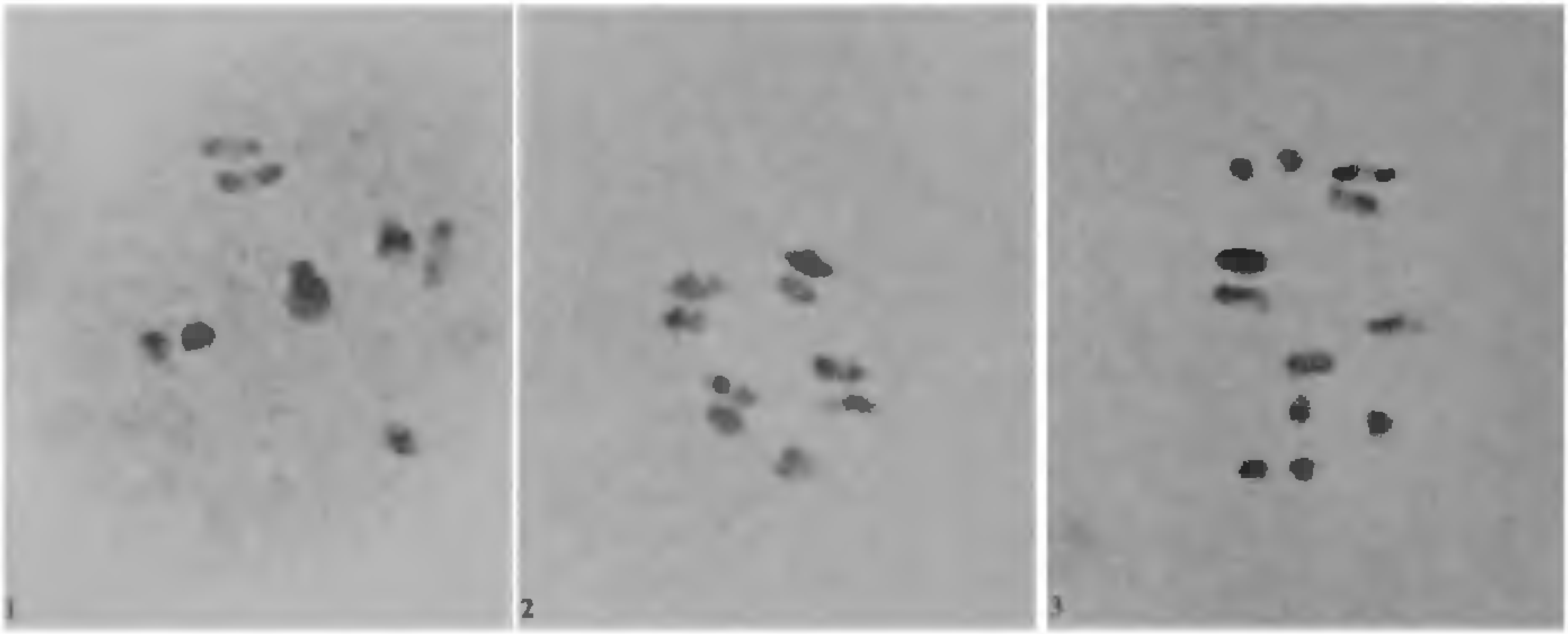

Figures 1–3. 1. PMC showing secondary association of bivalents at diakinesis (× 2372) **2.** Four groups of bivalents in PMC at metaphase I (× 2372) **3.** Precocious separation and secondary association of bivalents at metaphase I (× 2372).

per PMC and chiasma frequency ranged from 9–15 per PMC with a mean of 12.31 chiasma per PMC. The bivalents showed secondary associations in the groups ranging from 3 to 7 per PMC (table 1; figures 1, 2). PMCs (5%) showed early separation of bivalents and 2% PMCs unequal distribution of chromosomes at anaphase I (figure 3), rest of the PMCs showed equal separation of chromosomes at anaphase I and II; pollen fertility is 98%. Swingle[2] has kept both *C. nobilis* Lour. and *C. deliciosa* Ten. under *C. reticulata*; whereas Tanaka[3] has kept *C. nobilis* in sub section euacrumen of section acrumen and *C. deliciosa* in sub section microacrumen of the same section. This classification, however, was based on the differences in size of leaves, flowers and fruits (large leaves, flowers and fruits in euacrumen and small leaves, flowers and medium to large fruits in microacrumen). Present studies show a close homology between the genomes of two species as evidenced by regular bivalent formation and fairly high chiasma frequency.

Based on the secondary association of bivalents at metaphase I, the basic chromosome number in different plant species has been derived[4–7]. The presence of secondary association here suggests a remote polyploid origin of the genus, the maximum association in three groups of three bivalents each further indicates a basic chromosome number three ($n = 3$) for the present day *Citrus*. This also supports the observation of Banerjee[8] of three as the basic chromosome number in *Citrus*.

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INFLUENCE OF BUTACHLOR ON THE GROWTH AND AMMONIA ASSIMILATING ENZYMES OF *AZOLLA*

S. VENKATARAMANAN and S. KANNAIYAN
Department of Agricultural Microbiology,
Tamil Nadu Agricultural University,
Coimbatore 641 003, *India.*

AZOLLA is a water fern in which nitrogen fixing blue green alga—*Anabaena azollae* fix atmospheric nit-

Table 1 *Effect of Butachlor on the growth and the ammonia assimilating enzymes of Azolla*

Butachlor (ppm)	Mean Azolla weight (g)	% decrease over control	Units per mg of protein		
			GDH	GOGAT	GS
Control	23.00	—	4.94	412	235
25	22.50	−2.17	4.83	403	230
50	22.00	−4.35	4.81	386	225
75	21.00	−8.70	4.36	382	221
100	20.00	−13.04	4.20	380	214
125	18.00	−21.74	4.01	351	210
150	16.00	−30.44	3.79	325	202
175	14.00	−39.14	3.83	308	191
200	12.50	−45.65	3.05	302	180

rogen. Biological nitrogen fixation through *Azolla-Anabaena* complex is considered to be a potential biological system for increasing rice yield at comparatively low cost[1].

Butachlor-N-(butoxymethyl)-2-chloro′,6′-diethyl acetanilide is a herbicide commonly used to control the weeds in the rice field. It is applied to the rice field as granules or sprays on 7th day after sowing or transplantation before the weeds emerge[2]. A pot experiment was conducted to find out the effect of Butachlor on the growth and ammonia assimilating enzymes of *Azolla*. Mud pots filled with one kg of rice field soil and 4 lit of water were used in this experiment. An initial inoculum level of *Azolla* at 15 g per pot was added. The herbicide—Butachlor 50% EC at 25, 50, 75, 100, 125, 150, 175 and 200 ppm concentrations was sprayed over the *Azolla by using* a hand sprayer. *Azolla* samples were drawn on 3rd day and ammonia assimilating enzymes *viz* glutamate dehydrogenase (GDH)[3], glutamine synthetase (GS)[4] and glutamate synthase (GOGAT)[5] were estimated. Fresh weights of *Azolla* biomass were recorded on the 10th day after inoculation. Increase in the concentrations of Butachlor has gradually decreased the growth of *Azolla*. The reduction in the growth of *Azolla* has been noticed at higher doses of Butachlor. This indicates that Butachlor not only controls the weeds but also the growth of *Azolla* also which is useful for rice crop by supplementing organic nitrogen. The harmful effect of the herbicides on *Azolla* biofertilizer has been reported recently[6]. In general the ammonia assimilating enzymes *viz* GDH, GS and GOGAT have been considerably inhibited at higher concentrations (table 1). The inhibition has been found to be significant from 100 to 200 ppm levels and maximum at 200 ppm level. Growth and nitrogen assimilation of *Azolla* were reduced at concentrations between 0.1 and 10 ppm for each of the triazine dinitro aniline and urea herbicides where as chloramben at 1 ppm caused 99% reduction in nitrogen fixation and phenolic herbicides at 0.1 ppm caused 75% reduction[7].

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POTATO VIRUS X ON WILD POTATO SPECIES *SOLANUM CHACOENSE* FROM INDIA

R. B. S. SANGAR, R. A. SINGH and B. B. NAGAICH

Central Potato Research Institute, Simla 171 001, India.

SOLANUM CHACOENSE Bitt. is a tuber-bearing Solanum species, native of south America. It has got