

A NEW CHROMOSOME COUNT IN *ZEBRINA* SCHNITZL.

CHROMOSOME number in *Z. pendula* var. *quadricolor* Bailey is reported to be $2n=23$. The somatic complement consists of six chromosomes with median, five with submedian and 12 with terminal centromeres. The two satellited chromosomes are heteromorphic. This variety is suggested to have been evolved from the parent species by translocations which caused the loss of a centromere and heteromorphism of the satellited chromosomes.

Zebrina pendula Schnitzl. is an exotic ornamental, grown in gardens for its beautifully coloured leaves. Two distinct taxa namely, *Z. pendula* and *Z. pendula* var. *quadricolor* Bailey are known in this genus¹. Cytology of *Z. pendula* var. *quadricolor* is reported here for the first time.

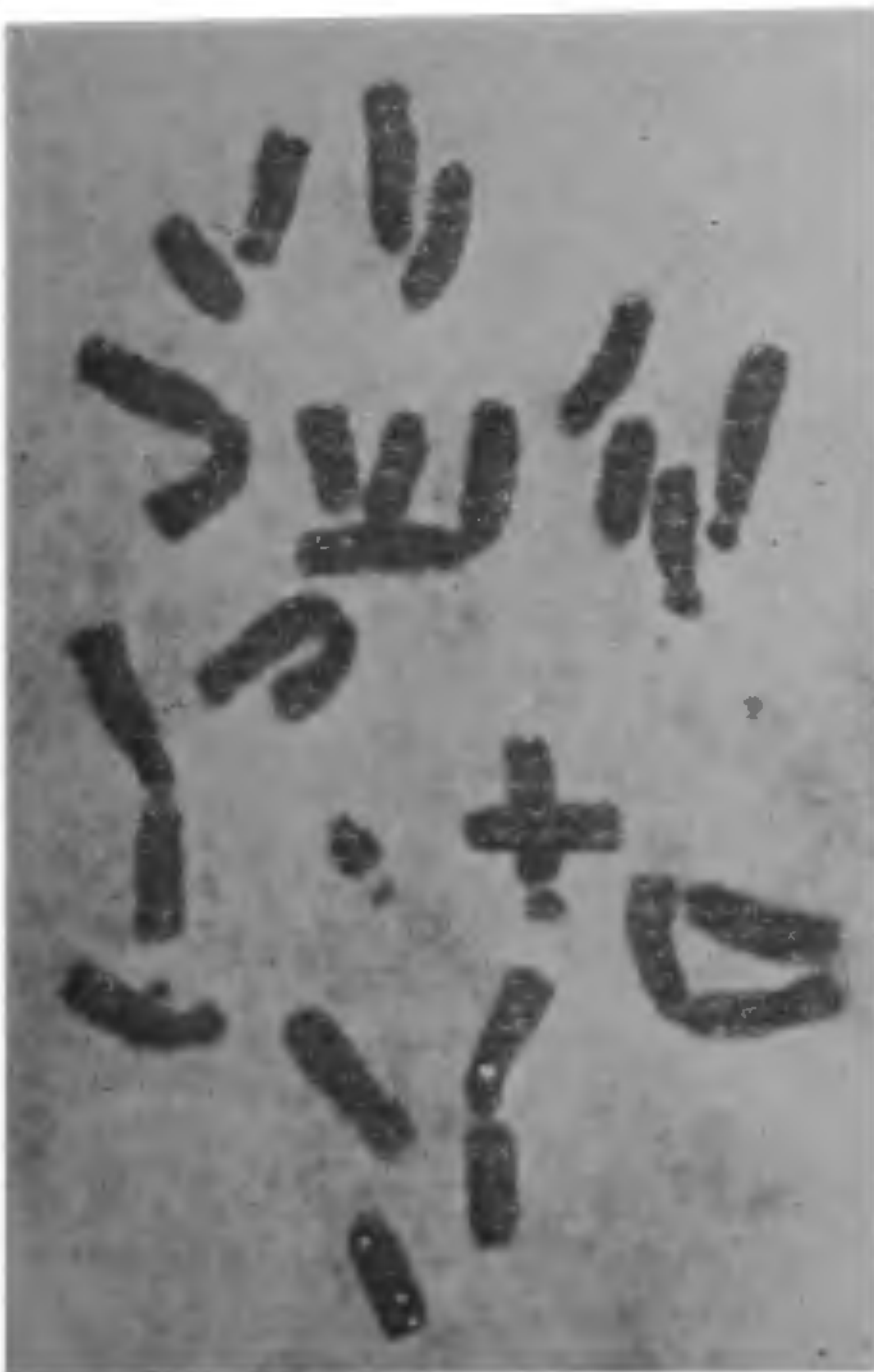


FIG. 1. Photomicrograph of somatic chromosomes in *Z. pendula* var. *quadricolor*. $2n = 23$, $\times 1,500$.

Root tip cells of plants grown in the Botanical Garden of the Kerala University showed $2n = 23$ chromosomes (Fig. 1). The somatic complement consists of six chromosomes with median centromeres (m_1 – m_6), five

with sub-median centromeres (sm_1 – sm_5) and 12 with centromeres at the terminal region (t_1 – t_{12}). The $t_{1,2}$ chromosome, which is the smallest in the complement and the m_1 chromosome are satellited (Fig. 2). Evidently the satellited chromosomes are heteromorphic,

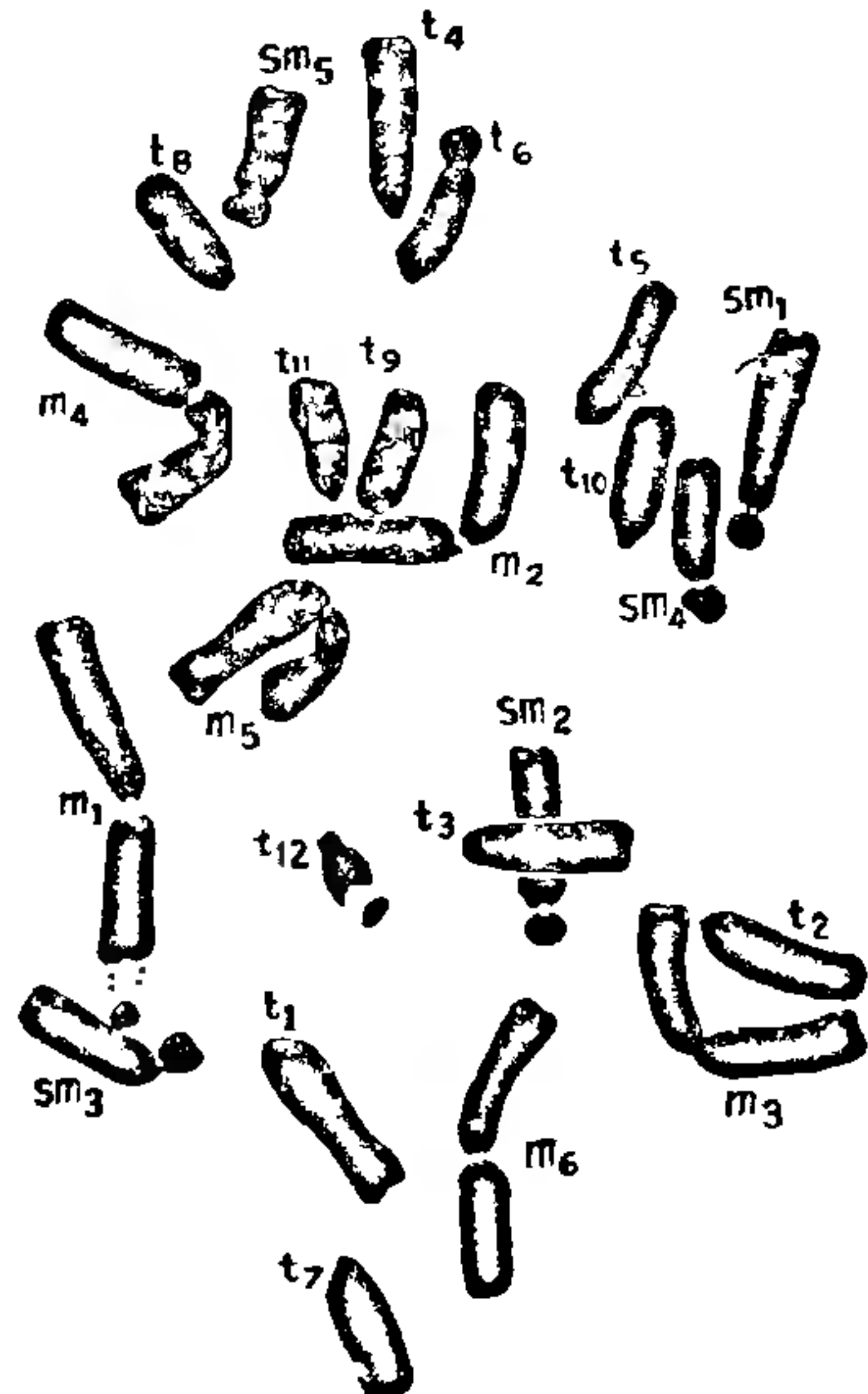


FIG. 2. Indian ink drawing of somatic chromosomes in Fig. 1.

Earlier studies have shown $2n = 24$ in plants of *Z. pendula* from different continents²⁻⁵. It has also been shown² that out of the 24 chromosomes of *Z. pendula*, four have centromeres at the median region, eight have centromeres at the submedian region and 12 have centromeres at the terminal region.

The present report of $2n = 23$ is a new chromosome count in this species complex as well as in the genus. Besides its aneuploid nature, *Z. pendula* var. *quadricolor* reported here is distinct from *Z. pendula* in that it has 6 metacentrics along with a reduced number of submedian chromosomes and that its two satellited chromosomes are markedly heteromorphic. This taxon might have evolved through chromosomal translocations, involving one of the satellited chromosomes and at least two other chromosomes of the parent species, resulting in the loss of a centromere and the heteromorphism of the satellited pair. It has been suggested⁶ that *Z. pendula* ($2n = 24$) itself has possibly evolved from an ancestor with $2n = 28$ through successive translocations and loss of centromeres. The present finding provides some indirect evidence to the feasibility of the above hypothesis.

Observations on the karyotype of collections of *Z. pendula* and *Z. pendula* var. *quadricolor* from several places in India are in progress. The results of these studies would help to identify the chromosomes involved in the structural changes reported here and may throw considerable light on the origin and evolution of *Z. pendula* var. *quadricolor*.

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INFLUENCE OF NATURAL AND SYNTHETIC INSECTICIDES ON NITROGEN FIXATION (C_2H_2 REDUCTION) IN THE RICE RHIZOSPHERE

THE environmental hazards and high costs associated with the application of synthetic commercial pesticides demand the use of alternate compounds in pest control. Plant products such as pyrethrins and neem preparations have been found equally effective against a wide range of insect pests with low mammalian toxicity and pollution hazards¹. Although pesticides are not directly applied to the soil, the latter is the eventual sink in one way or other. The benefit of pesticides as pest combatants could be mitigated by detrimental effects on microbial processes of importance to the soil fertility. The effect of commercial pesticides on nitrogen fixation in pure cultures has been studied^{2,3,7}. However, information on nitrogen fixation as influenced by synthetic and natural compounds having pesticidal activity is not available. The present report deals with the influence of two organophosphate insecticides and natural products having insecticidal effect, on nitrogen fixation (C_2H_2 reduction) in the rhizosphere soil.

A field experiment for the evaluation of relative efficiency of synthetic and natural compounds having insecticidal activity was conducted during *rabi* 1979 at the Institute farm. Two organophosphate insecticides, quinalphos (Ekalux) and phosalone (Zolone) at 0.5 kg/ha and plant products, pyrethrum 0.005%,

neem extract 1%, neem oil 1% and allitin 0.5% were sprayed with a hand compression sprayer on the plants on 50, 65 and 75 days after transplantation. All treatments including control were replicated thrice and received urea at 50 kg N/ha. Two plants from each plot (six plants per treatment) were carefully uprooted after 10 days of application of the respective compounds and the rhizosphere soil (2 g fresh weight) was transferred to vacutainer tubes (125 × 13 mm) for C_2H_2 reduction analysis. The soils received 0.5% (w/w) cellulose and 0.5 ml water to maintain flooded conditions. The tubes were stoppered and the gas phase was replaced with pure acetylene (10% by volume) through a gas tight hypodermic syringe and were incubated at 28–30°C in the dark for 24 h. A 0.5 ml sample of the gas phase from each tube was then analysed for ethylene (C_2H_4) production on a gas chromatograph fitted with a hydrogen flame ionisation detector and 1,500 × 3 mm column of 190–120 mesh Porapak R. The nitrogenase activity was expressed as μ moles of C_2H_4 formed/g/day. *Azospirillum* was isolated from the roots of 93-day old plants following the methods already described^{4,5}. Nitrogenase activity of the pure cultures isolated from the different treatments was determined by C_2H_2 reduction.

The peak rhizosphere nitrogenase activity was noticed in the first sampling (60 days after transplanting) which decreased further (Table I). All compounds inhibited the rhizosphere nitrogenase activity, although the extent of inhibition varied with individual compound. Neem products and organophosphate insecticides were less inhibitory on the rhizosphere nitrogenase activity while the inhibition was more pronounced in pyrethrum and allitin treated samples. Interestingly, nitrogenase activity decreased with increasing vegetation period irrespective of the treatment. Nitrogenase activity was high in *Azospirillum* cultures isolated from the roots of phosalone and quinalphos treatments as compared to cultures from other treatments on 93 days after transplanting (Table I).

Stimulation of nitrogen fixation was noticed in γ -BHC amended soils due to the stimulation of microorganisms⁶. However, application of the same compound to pure cultures had no effect on nitrogen fixation⁸. Moreover, application of benemyl to soil greatly stimulated the population and nitrogen fixation of *Azospirillum*². Our results further show that the organophosphate compounds phosalone and quinalphos and certain natural products having insecticidal activity when sprayed on plants while inhibiting the rhizosphere nitrogenase activity exerted stimulation on the nitrogenase of *Azospirillum* isolates from the roots. This indicates the necessity for a careful evaluation on the effects of pesticides on nitrogen fixation in view of the differential nitrogenase activity in the rhizosphere and root inhabitants.