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*.

The authors are thankful to Prof. C. A. Ninan for suggestions.

Department of Botany, Kerala University, Kariyavattom, Trivandrum, *October* 5, 1979.

K. LALITHAMBIKA BAI.
P. I. KURIACHAN.

1. Stearn, W. T., in *Dictionary of Gardening*, Ed. Patrick, M. Synge, The Clarendon Press, Oxford, 1956, **4**, 2305.
2. Darlington, C. D., *J. Genet.*, 1929, **21**, 207.
3. Fedorov, A., *Chromosome Numbers of Flowering Plants*, Komarov Botanical Inst., Leningrad, 1969, p. 231.
4. Sharma, A. K., *Genetica*, 1955, **27**, 323. Cited from Archana Sharma, *J. Cytol. Genet.*, 1971, p. 19.
5. Jones, K., *The Nucleus*, 1978, **21**, 152.

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 hazards[1]. 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%, need 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 *n* 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 microorganisms[6]. However, application of the same compound to pure cultures had no effect on nitrogen fixation[3]. Moreover, application of benomyl 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 inhibitants.

TABLE I

Effect of natural and synthetic insecticides on rhizosphere nitrogenase and Azospirillum *isolates from roots*

Treatments	Nitrogenase activity of rhizosphere soil *n moles of C_2H_4 formed/g fresh soil/day			Nitrogenase activity of *Azospirillum*
	60 DAT**	75 DAT**	85 DAT**	isolated from roots (*n moles of C_2H_4 formed/ml medium/ day
Control	101 ± 6·0	34 ± 3	3·12 ± 0·15	14·88 ± 0·55
Neem extract	58 ± 2·5	31 ± 2	1·92 ± 0·40	15·36 ± 0·11
Neem oil	43 ± 1·0	3·36 ± 0·35	1·92 ± 0·52	16·32 ± 0·75
Pyrethrum	20 ± 1·5	6·80 ± 0·35	2·16 ± 0·45	17·76 ± 0·23
Allitin	32 ± 1·6	4·10 ± 0·20	1·92 ± 0·75	17·10 ± 0·35
Quinalphos	40 ± 3·3	3·36 ± 0·34	1·92 ± 0·52	23·28 ± 0·80
Phosalone	41 ± 3·2	4·10 ± 0·32	2·79 ± 0·25	18·48 ± 0·15

* Nitrogenase activity ± standard deviation of the mean of triplicate samples.

** DAT = days after transplanting. The rhizosphere soil samples were collected 10 days after the application of respective compounds. The nitrogenase activity of the *Azospirillum* cultures isolated from the roots (93-day plants) under different treatments was assayed after incubation in C_2H_2 for 24 h.

The authors thank Dr. H. K. Pande, Director, for his interest. The work was supported, in part, by the International Atomic Energy Agency, Vienna, Austria. The senior author acknowledges the support from the University Grants Commission.

Laboratory of
Soil Microbiology,
Central Rice Research
Institute,
Cuttack 753 006 (Orissa),
October 3, 1979.

D. N. NAYAK.
I. C. PASALU.
V. RAJARAMAMOHAN RAO.

1. Annonymous. "Insecticide breakthrough drives back cotton pests." In *Third World Agriculture*, 1979, **1**, 18.
2. Charyulu, P. B. B. N. and Rao, V. R., *Curr. Sci.*, 1978, **47**, 822.
3. Mackenzie, K. A. and MacRae, I. C., *Antonie van Leeuwenhoek*, 1972, **38**, 529.
4. Nayak, D. N. and Rao, V. R., *Arch. Microbiol.*, 1977, **115**, 359.
5. —, Swain, A. and Rao, V. R., *Curr. Sci.*, 1979, **48**, 866.
6. Raghu, K. and MacRae, I. C., *Can. J. Microbiol.*, 1967, **13**, 622.
7. Wood, P. A. and MacRae, I. C., *Bull. Environ. Contam. and Toxicol.*, 1974, **12**, 26.

THE CHROMOSOMAL LOCATION OF A MAJOR GENE FOR SEMI-DWARFISM IN THE WHEAT VARIETY KALYANSONA

THE semi-dwarf varieties of the present day cultivated wheat have derived the dwarfing genes from the Japanese variety Norin 10 which is known to carr, two major independent recessive genes for height reduction[1-3]. These two genes have been assigned the symbols *Rht* 1 and *Rht* 2[4]. Chromosomal location of *Rht* genes has been difficult to determine by monsomic analysis since plant height in wheat is quantitative in nature and monosomy itself has considerable influence on it. Gale and Law[5] have described the effects of monosomy on plant height shown by the Bersee monosomics. Many of the possible locations for the *Rht* alleles pinpointed by monosomic analyses fall in the homoeologous groups in which the effects of monosomy mimic those of height reducing factors. Hence monosomic analysis cannot provide the desired information on chromosomal location of genes for height reduction. A different method of accurately identifying the *Rht* genes is now available. Insensitivity to gibberellic acid (GA) is closely associated with plant height in the Norin 10 derivatives[6]. Further, GA-insensitivity behaves as a qualitative character and hence is suitable for monosomic analysis[5]. Segregating plants can be clearly classified at the seedling