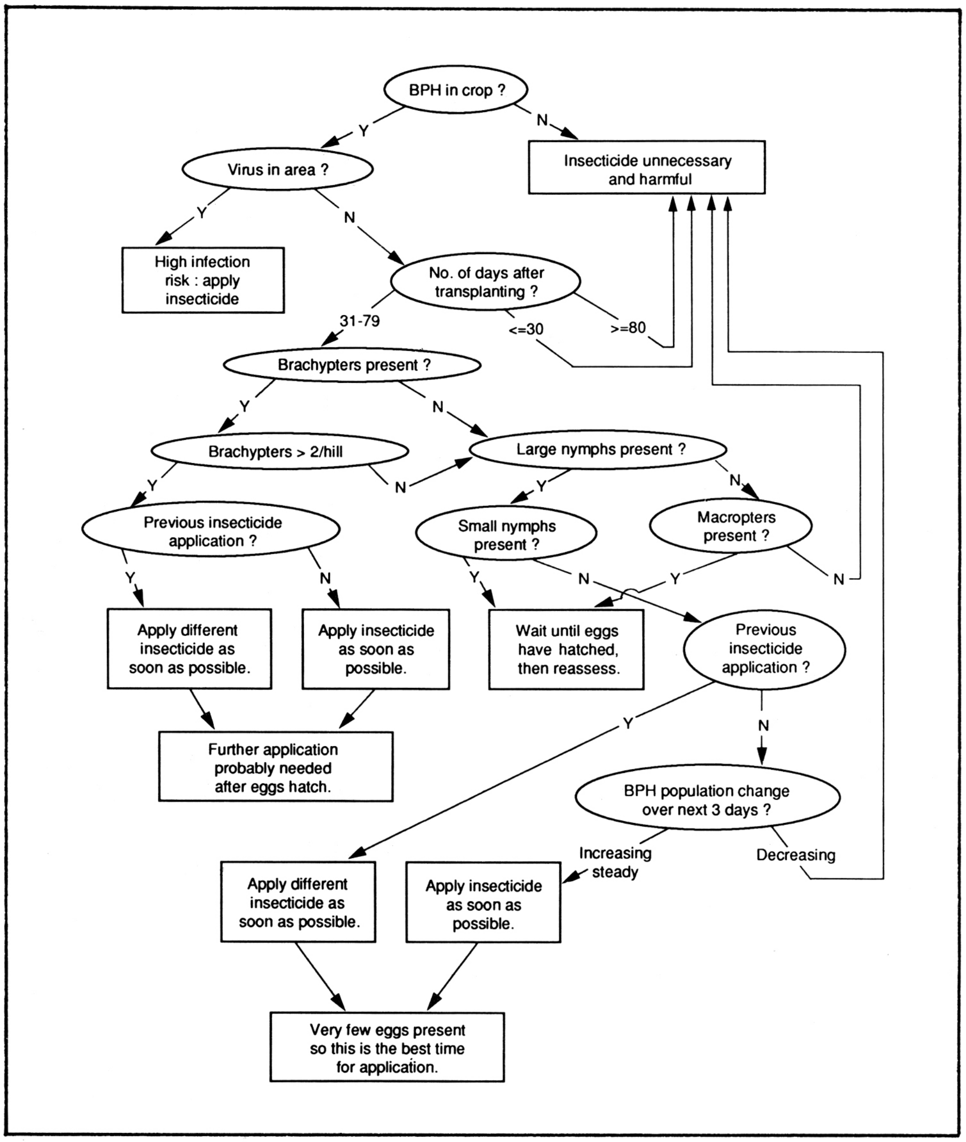
expert would. They can improve decisionmaking in agriculture, either directly or as a training device.

The system, built using an expert system shell (Crystal), searches for the appropriate recommendation. The computer asks the user questions, via a series of interactive screens (starting at the top of the figure). The answers lead to a recommendation.

The expert system is programmed to recommend that insecticides be applied against BPH only in certain circumstances, at particular stages of crop growth. For example, if only large nymphs are present between 31 and 79 d after transplanting and insecticide was previously applied, the computer program assumes that natural enemy action has been disrupted and that the absence of small nymphs reflects absence of eggs—therefore it is the best time to spray. The computer suggests an alternative insecticide because nymphs now present may be resistant to the previous insecticide.

Any expert system requires considerable refinement and development before it manages effectively. This one needs detailed advice about insecticides and application methods, integrated with advice for controlling other pests, in tune with local conditions. It shows the potential value of the technique in pest management. A version in PROLOG will be available shortly, for comments, on receipt of an IBM MSDOS formatted 5.25" diskette. □



A search graph representing an expert system designed to identify insecticide application tactics for BPH control. A recommendation (rectangular) may be reached by a variety of routes, depending upon the answers, often a simple yes (Y) or no (N), to a series of questions (oval).

Effect of neem on yeast-like symbionts (YLS) harbored by brown planthopper (BPH)

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In the biology of many homopterous insects, endosymbionts seem to fulfill the lipid and sterol requirements of sap-sucking insects, such as planthoppers, which feed on sugar and amino acid-rich, but lipid-deficient, phloem photosynthates. Endosymbionts also evidently produce antibiotic defense substances. If endosymbionts are killed by heat treatment, the insect body becomes covered with mold. We tested whether exposure of BPH nymphs to rice plants treated with neem seed derivatives would affect the YLS populations that BPH harbor.

Treatments were 20-d-old IR20 plants sprayed with various neem preparations (see table), IR20 seedlings grown in soil where a neem cake-coated urea mixture (1:1 wt/wt) had been incorporated, and untreated plants as control. Each of treated and control plants was then infested with 25 first-instar BPH nymphs. Insect survival was recorded at 4-d intervals.

When nymphs reached the fifth-instar stage, they were collected, weighed individually, and homogenized with 0.8% saline solution to a known volume. Aliquots of homogenates were taken using Thoma pipettes. An improved Neubauer hemocytometer (Weber, England) was used under a phase contrast microscope for counting symbionts.

The symbionts were counted from the 5 squares (each 1 mm^2) of the hemocytometer. Symbionts per insect was calculated and expressed per mg body weight as follows: Symbionts = $a(x+m)/n.v$, where a = symbionts in a known volume of homogenate, m = weight of insects homogenized, n = number of insects homogenized, v = volume of homogenate sampled in the hemocytometer, and x = volume of saline solution used to homogenize nymphs. The experiment was replicated four times.

A second experiment (see table) used 30-d-old IR20 plants sprayed with various neem preparations with untreated plants as controls. Treated and control plants were infested with 30 4-d-old nymphs/replication. Nymphal mortality was recorded 4 and 8 d after treatment. Surviving individuals were removed and homogenized to count endosymbionts.

The YLS population was significantly smaller in BPH that fed on neem-treated IR20 plants than on untreated ones (see table). This decrease could be due to direct antibiotic effect of neem's active principals on the endosymbionts or indirectly through BPH fat bodies which store YLS. Insect brains and fat bodies are highly sensitive to triterpenoid azadirachtin, the principal bitter component in neem.

Nymphs developing on treated plants weighed less than those on control plants. Nymph mortality was significantly higher on treated plants than on controls, mainly because of molting impairments. ☐

Effect of neem seed derivatives on survival and body weight of fifth-instar BPH nymphs and YLS they harbor.[a]

Treatment[b]	Mortality[c] (%)	Body wt (mg/nymph)	YLS ($x10^4$/nymph)
		Experiment I	
NO 3%	14 b	1.05 a	24.72 a
NO:CAO (2:l)	18 ab	1.12 a	27.45 a
NSKE 5%	80 a	1.02 a	24.91 a
NCE 10%	63 c	1.12 a	27.42 a
NCU (basal)	67 c	1.16 a	31.08 a
Control (untreated)	–	1.42 b	40.35 b
		Experiment II	
NO 3%	86 a	1.10 ab	20.95 ab
NO:CAO (2: 1)	83 a	1.07 ab	19.63 ab
NSKE 5%	84 a	0.93 a	17.21 a
NCE 10%	15 b	1.09 ab	21.04 ab
NSB (2500 ppm)	66 c	1.38 b	26.80 b
Control (untreated)	–	1.88 c	42.32 c

[a]Within an experiment, means in a column followed by the same letter are not significantly different at the 5% level by DMRT. Each treatment was replicated four times. [b]NO = neem oil, NO:CAO = neem oil:custard-apple oil (vol/vol), NSKE = neem seed kernel extract, NCE = neem cake extract, NCU = neem cake-coated urea, NSB = neem seed bitters. [c]Corrected mortality recorded when nymphs were 12 d old.

A new tarsonemid mite, *Ogmotarsonemus* sp. (Tarsonemidae: Acari), on rice in Tamil Nadu, India

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In a survey of phytophagous mites, brown discoloration and necrosis were noted in rice leaf sheaths near ground level. Investigation revealed a tarsonemid mite *Ogmotarsonemus* sp. infestation at all development stages.

Eggs are almost round, transparent, and in clusters. Nymphs are translucent to light white, found between sheaths and culms and inside sheaths. They are oblong with two pairs of legs in the anterior propodosoma and one pair in the metapodosoma. They move sluggishly, staying in the necrotic area even when disturbed.

Adults are light brown with four pairs of legs, more sclerotized, and quite active. Females are oblong; males are broader, with characteristic flange-like enlargement in the femorogenu of the fourth leg.

The first species described under this genus is *Ogmotarsonemus erepsis* Lindquist (1986), attacking *Spartina* sp., a saltmarsh grass in Georgia, United States. This species on rice is new, and is being described for publication elsewhere. ☐

Neem for control of rice thrips

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We evaluated neem products for thrip control in late sornavari in rice planted in Jun-Jul 1987 in Chengalpattu district. Rice thrips *Stenchaetothrips biformis* (Bagnall) can damage leaves in nursery plants and in the young transplanted crop. The randomized block design had three replications using variety TM8089. When incidence was severe, neem products and chemical insecticides (standard checks) were applied at 20 d

Effect of neem products on rice thrips at Chengalpattu, India, 1987.

Treatment	Rate	Thrips[a] (no./ sweeps) 2 DAT
Neem seed extract	5%	24.5 bc
Neem seed extract	10%	19.5 ab
Neem cake extract	5%	34.6 c
Neem cake extract	10%	32.1 bc
Neem oil	2%	7.5 a
Phosphamidon 100 EC	250 ml/ha	11.2 a
Fenthion 100 EC	500 ml/ha	6.6 a
Untreated control	–	96.3 d

[a]Mean of 3 replications. Means followed by a common letter are not significantly different at the 5% level based on LSD value. DAT = days after treatment.