Disease control

….azoxystrobin shows promise on beans
The Pea Growers Research Organisation (PGRO) has been testing azoxystrobin (Amistar) for the control of diseases (especially Ascochyta) in beans. Although the strobilurin is not registered in the UK for use on beans, the PGRO hopes to gain off-label approval next season.

…beneficial bacterium reduces apple disease
Replant disease of apples is caused by a variety of plant pathogens including species of *Rhizoctonia*, *Pythium*, *Cylindrocarpon* and *Phytophthora*. Work at the USDA Tree Fruit Laboratory in Wenatchee has shown that soils amended by the growth of a cover crop such as white wheat leads to an increase in the population of the bacterium *Pseudomonas putida* and this reduces the losses associated with the disease.

…biofungicide against rhizoctonia
Sourcon-Padena from Tuebingen, Germany has developed a mix of selected naturally occurring soil organisms that stimulate plant performance. When applied to the seed, Proradix remains at the plant roots through to maturity stimulating the plant in two ways: it commandeers available nutrients and space thereby preventing the spread of pathogenic fungi; it activates the plant's own defence system. Sourcon-Padena claims that in independent trials a rhizoctonia attack effecting 50% of untreated potato plants was held to 5% where Proradix had been used.

…A German bacterial product
FZB Biotechnik, Germany is demonstrating a crop protection product based on *Bacillus subtilis*. FZB24, containing selected strains of the bacterium, has been shown to increase the yield of potatoes by 3% when dusted onto seed tubers. It is thought to work by competing with pathogens for space and nutrients around the seed and roots. The product can also be applied to vegetable seeds as a wet dressing. FZB24 was previously marketed by Bayer Vital.

Weed control

….new glyphosate formulation
Syngenta has introduced a new formulation of glyphosate, Touchdown Quattro, for use as a pre-harvest desiccant. The product contains patented adjuvant System 4 to improve chemical penetration and translocation. The adjuvant combats the negative effects of calcium and magnesium ions present in some water sources and increases spray retention on leaf surfaces.

…biological control of rubber vine weed
A biological control programme funded by the Queensland Meat Growers and Packers and implemented by the Queensland Department of Natural Resources has shown that the imported and invasive rubber vine weed (*Cryptostegia grandiflora*) can be effectively controlled by the pyralid caterpillar (*Euclasta whalleyi*) and the rust fungus (*Maravalia cryptostegiae*).

Insect control
…Silica-sec against insects on stored seeds
With the demise of Actellic powder (pirimiphos-methyl) for the control of storage pests at the end of 2002, pesticide companies are seeking replacement products. Dalgety Arable has developed Silica-sec in conjunction with Central Science Laboratories. The inert material, not classed as a pesticide, is spread on grain to damage the outer coat of grain mites and other storage pests.

…bioinsecticide for mosquito control
Scientists at North Carolina State University have identified a compound found in tomatoes that is highly toxic to mosquitoes and is more effective than the chemical DEET, used around the world as an insect repellent and killer. The patented substance has the code name IBI 246 and has already been licensed to a manufacturer of biochemical insecticides. The tomato derived compound is also capable of acting as a repellent to fleas, cockroaches, ants and biting flies. Application to the US Environmental Protection Agency for approval for use has been made and the company concerned, Insect Biotechnology, says production costs will equate to those of DEET.

…bioinsecticide
The first new fungal insecticide jointly developed by Zhejiang University and Hangzhou Tianbang Science and Technology Co Ltd has been developed. The insecticide targets biting and sucking insects, such as aphids, leafhoppers and mites. The product incorporates a *Beauveria bassiana* strain. It has high activity but is harmless to vertebrates and non-target organisms.

Organic farming

The Soil Association has commented on a UK National Farmers' Union report that over a third of organic farmers are losing money by saying that retailers must ensure that a fair price is paid for organic food and that imports must be reduced. Meanwhile, the Ritz Hotel, London has become the first London hotel to offer certified organic meals following its successful application to be licensed by the Soil Association (http://www.soilassociation.org)

Tick control

Taensa of New Haven, CT, signed a Cooperative Research and Development Agreement with the Connecticut Agricultural Experiment Station. Under the deal, both parties will demonstrate the efficacy of Taensa's Tick-Ex product for application to control deer tick species, prevalent in Connecticut, and to control Lyme disease. The product is a patented, naturally occurring *Metarhizium anisopliae* fungus strain BIO 1020, which has been shown to be an effective tick control agent. The strain was originally developed by Bayer and has been exclusively licensed to Taensa on a global basis.

Pesticides linked to prostate cancer in farmers

A National Cancer Institute researcher says pesticide use and heredity may combine to increase farmers' risk of developing prostate cancer. Exposure to certain pesticides increases the risk of farmers developing the disease, as does a family history of prostate cancer. Research has shown a higher-than-normal incidence of cancer among farmers, even though they generally have lower rates of other cancers. The (now-banned) chlorinated pesticides such as DDT appear to cause a statistically significant increase in the risk of prostate cancer. Exposure to high levels of methyl bromide also causes a significant increase.

Synthesis of mosquito pheromone

Materia Inc announced its successful synthesis and preliminary field testing of the Mosquito Oviposition Pheromone (MOP). Pathogen-vectoring mosquitoes in the genus Culex secrete this natural substance. The use of synthetic MOP will enable mosquitoes carrying West Nile Virus and other dangerous causative agents to be controlled without the need for broadcast spraying of large urban areas with conven-

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tional pesticides. Conventional pesticides kill insects indiscriminately, even beneficial insects, and are a growing environmental and health concern. The use of non-toxic insect pheromones to disrupt normal mating patterns or as attractants for capturing insects in a localized area is well established. Insect pheromones are currently being used successfully as a method of controlling insect populations for many agriculture crops. Materia Inc provides innovative catalyst technologies as solutions for demanding problems in the Life Science, Materials, and Chemical Manufacturing industries (http://www.materia-inc.com)

Acrylamide in food linked to herbicides

A research link between herbicides and acrylamide, a potential carcinogen that turns up in cooked food, has been established. Experiments have shown that acrylamide may be released by the effects of either heat or light on polyacrylamide which is present in some herbicide (*e.g.* glyphosate) formulations. An earlier view that acrylamide is naturally formed when food is cooked was published by the World Health Organisation. That view is challenged by this finding.

Interaction between plants and their diseases

Some fungal pathogens can circumvent classical defense responses but the biochemical mechanisms behind these processes have been unclear. K. Bouarab and colleagues at the *Sainsbury Laboratory*, John Innes Centre, Norwich, UK show that a fungal saponin-detoxifying enzyme mediates suppression of plant defenses in a two-step process (*Nature* 2002, **418**, 889-892).

Bouarab *et al.* used strains of the tomato leaf spot fungus *Septoria lycopersici* grown on *Nicotiana benthamiana* leaves. They observed that a fungal saponin-detoxifying enzyme hydrolyses plants antimicrobial saponins. The degradation product of this hydrolysis suppresses the induced defense responses by interfering with fundamental signal transduction processes in plants, leading to disease resistance.

Also published in a recent issue of *Nature*, an international team of scientists from the John Innes Centre, the University of Edinburgh, the University of Toronto and The Noble Foundation announced the discovery of the gene encoding the protein DIR1 (defective in induced resistance) that is a key step in the pathways that enable plants to protect themselves against disease, and is involved in the transmission of a warning signal from plant cells infected by disease (*Nature* 2002, **419**, 399-403)

Dairy spray against powdery mildew

Peter Crisp of the University of Adelaide in Australia has shown that milky water sprayed once a fortnight can control powdery mildew on grapes. How milk works is not clear, but full-fat seems to work best. Milk fat or whey protein may feed microorganisms on the vine surface that then compete for space or even consume the mildew spores. Mildew currently cost the Australian wine industry A$30 million a year (http://www.adelaide.edu.au/).

Corn self-defence against caterpillars

Tibo Pechan and colleagues at Mississippi State University have shown in a study of a strain of corn resistant to attacks from fall armyworm caterpillars and southerwestern corn borers, that the key to its defence lies in the production of a unique enzyme called 33-kDa, which plants manufacture within an hour of attack. The enzyme interferes with the membrane which lines the stomachs of the caterpillars, interfering with its ability to absorb nutrients and rendering it more susceptible to toxins and pathogens. When the scientists genetically engineered plants to express excess 33-kDa they observed even more pronounced results (*Proceedings of the National Academy of Sciences*, http://www.pnas.org/cgi/doi/10.1073/pnas.202224899)

Sex pheromone link to insect evolution

Wendell Roelofs and colleagues at Cornell University have discovered a gene, delta-14, that can regulate the attractant chemicals produced in sex-pheromone glands of female European corn borers. The gene can be suddenly switched on, changing the pheromone components that females use to attract males for mating. Such changes may be involved in the evolution of new insect species. The discovery has major implications for the control of insect populations through disruption of mating, suggesting that over time current eradication methods could become ineffective, similar to the way insects develop pesticide resistance (*Proceedings of the National Academy of Sciences, http://www.pnas.org/cgi/doi/10.1073/ pnas.152445399)*

Countering plant defences

According to a report in *Nature*, 2002, **419**, 712, May Berenbaum and colleagues from the University of Illinois, Urbana, have shown that the success of the corn earworm, *Helicoverpa zea*, may be due to its ability to eavesdrop on plant defences and produce detoxifying enzymes, including cyctochrome P450, to counter the toxins that plants under attack synthesise. The plant messenger molecules, jasmonate and salicylate. activate earworm cytochrome P450 genes just as (or before) the molecules induce production of toxins within the plant. This research raises questions about the value of treating crops with signal molecules to induce anti-insect defences, as alerting the insect in this way may enable it to get its retaliation in first.

Endocrine disruption

In a study published in *Environmental Health Perspectives*, 2002, **110**, 1081, Warren Porter and a team from the University of Wisconsin-Madison, USA, have shown in studies on mice given low levels of widely used herbicides in their drinking water that reproduction was disrupted most strongly at very low doses – for example, at only 0.039 ppm 2,4-D, about 1/7th the EPA recommended limit for drinking water. Above this low limit protective responses may override the effect of the chemicals. What this low limit is and whether the effects are the same in humans is as yet unknown.

Rapidity of resistance spread

Richard Ffench-Constant and his team from Bath University, UK, have analysed 75 laboratory populations of fruit flies originally collected in the 1960s, and shown that 28 were DDT-resistant, including flies from all continents except Antarctica (*Science*, 2002, **297**, 2253). In all cases of resistance the researchers found the same mutation in the genome which stimulated a nearby gene to produce enzymes which munch up harmful chemicals. This mutation was not present in any fly strains collected in the 1930s, prior to DDT use. It is suggested that the mutation spread rapidly in the wild, even to strains that never encountered DDT, raising questions on the difficulty of eliminating pesticide resistance even when its use is stopped.