# Peanuts without poison

## Minimising aflatoxin contamination offers significant health benefits in countries where peanuts are an important food, reports Rebecca Thyer

Indonesia has a big appetite for peanuts – producing more than 800,000 tonnes each year. But demand outstrips local supply, making Indonesia one of the world's largest peanut importers. Nearly all peanuts are consumed as food, especially among poorer communities, because they are a rich source of protein, oil and vitamins. However, an under-recognised problem associated with peanut consumption by humans is the risk of aflatoxin contamination.

Aflatoxin is one of the most powerful natural toxins known – causing cancer, suppressing immunity and interfering with nutrient uptake.

Dr Graeme Wright, from the Queensland Department of Primary Industries and Fisheries, says aflatoxin invades peanuts during production or soon after harvest and is more prevalent in peanuts exposed to end-of-season drought stress.

He recently led an ACIAR project into aflatoxin contamination in Australia and Indonesia. In collaboration with the Indonesian Legumes and Tuber Crops Research Institute in Malang, East Java and the Southeast Asian Ministers of Education Organization BIOTROP Institute in Bogor, West Java, the project aimed to minimise aflatoxin contamination in Indonesian and Australian peanuts through research, development and extension of appropriate on-farm and post-harvest management practices.

In Indonesia, large numbers of peanuts are produced in the drier eastern areas – East Java, Sulawesi and the East Nusa Tengara region – and are often exposed to the severe end-of-season drought stress that favours aflatoxin development.

For Australia's 60,000-tonne industry, aflatoxin risk is also closely related to drought stress. Although contamination has been a problem in the industry for nearly 20 years, it only recently became a major

In the foreground is an untreated plot in southern India; in the background are peanut plants treated with an insecticide.

## Peanuts for a new age

### NEW TECHNOLOGY MAY HELP INFORMATION ABOUT SUCCESSFUL PROJECTS TO INCREASE PEANUT PRODUCTION REACH TWO MILLION FARMERS, REPORT KELLIE PENFOLD AND REBECCA THYER

PARTNER COUNTRY: India PROJECTS: CS2/1994/050, CS1/1997/114 DESCRIPTION: The projects aimed to increase peanut yields by breeding more drought-tolerant genotypes and tackling white grub infestations
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A major crop in many tropical and semi-tropical areas of the world, peanuts (also called groundnuts) rank in the top 10 of the world's most important food crops and are a major source of cooking oil and protein.

For example, in India about 14 million families farm 8.6 million hectares of peanuts, but it is estimated the crop may influence the livelihood of more than 100 million Indians.

Like Australian crops, Indian peanut yields are often severely retarded by a lack of water during crop growth. This arises from unpredictable rainfall, high evaporation and production on degraded and low water-holding soils.

The breeding of more drought-tolerant genotypes could provide a long-term option to increase productivity in drought-prone environments.

Through an ACIAR-funded project, Dr Graeme Wright of the Queensland Department of Primary Industry and Fisheries (QDPI&F), his peanut team and researchers from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) set out to improve the drought tolerance of peanuts using breeding approaches that draw on physiological traits.

Through this breeding approach, the team was able to select high-yielding genotypes with drought tolerance.

Dr Wright says the project was hugely successful, with drought-tolerant varieties now at very advanced stages in both Australia and India. "Their introduction should improve yields in both countries and lead to improved food security for India's rural communities," he says.

The economic benefits of this ACIAR project speak for themselves – if a quarter of Indian growers adopt a drought-tolerant variety, then within 10 years an economic benefit of about 71,970 Lakh Rupees (A$287 million) net present value will be felt. Drought-tolerant peanuts will also have major economic benefits for Australian growers.

However, drought is not the only destructive force facing peanut production. White grubs – the soil dwelling larvae of scarab beetles – feed on the roots of the peanut plant, killing seedlings and sometimes older plants, as well as reducing drought tolerance and final yields. They can also attack important crops such as sugar cane and millet.

In India, $800 million worth of peanut crop is

issue – primarily because of the introduction of heavy penalties by peanut buyers. Penalty payments are applied on delivery to loads with aflatoxin levels of between 8 and 400 or more parts per billion (ppb).

With risk management goals in mind, Dr Wright and the team set out on a fact-finding mission. They found that fresh peanuts in Indonesia's 'wet produce' markets were commonly contaminated to levels well above acceptable health risk levels (35ppb). About 45 per cent of samples taken contained more than 50ppb, 33 per cent had more than 300ppb and 22 per cent exceeded 1000ppb.

They also found that contamination was fairly limited soon after harvest but became more serious at the fresh market retailer. It was clear that post-harvest aflatoxin contamination was the cause of this build-up in the food chain, specifically inadequate drying and poor storage conditions associated with high atmospheric humidity. Subsequent research found that the risks of pre-harvest contamination were relatively small in most production situations.

The project also road tested a low-cost immuno affinity-based analytical system for determining aflatoxin in peanuts and provided training to Indonesians at the three collaborating institutions. Dr Wright says project results will help Indonesia determine future research directions to minimise aflatoxin and hopefully provide policy makers with useful data to implement appropriate regulatory programs to minimise aflatoxin in the peanut food chain. ◂

## What is aflatoxin?

Aflatoxin is a carcinogenic, immune-suppressing and anti-nutritional contaminant. It is a major problem for human food and animal feed quality throughout the world. The toxin is about 25 times more harmful to people, causing liver diseases such as hepatitis and liver cancer. This is driving a push to decrease the levels of aflatoxin allowed in foods.

Trade of aflatoxin-prone commodities is already controlled and regulated. In countries with developed food safety systems, the consequences of aflatoxin are largely economic, affecting the price received for peanuts by farmers. However, in developing countries the price is mostly paid through the health of the population, since contamination by toxin is commonly ignored.

PARTNER COUNTRY: Indonesia
PROJECT: PHT/1997/017: Reducing Aflatoxin in Peanuts Using Agronomic Management and Bio-Control Strategies in Indonesia and Australia
DESCRIPTION: Aflatoxin contamination of peanuts is a major health risk for Indonesians, yet its risks can be better managed
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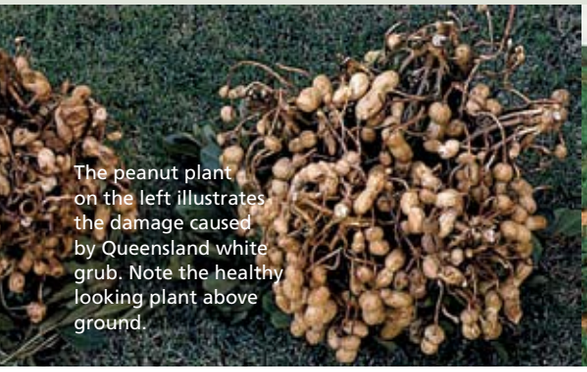

The peanut plant on the left illustrates the damage caused by Queensland white grub. Note the healthy looking plant above ground.

ACIAR white grub project leaders John Rogers, Anitha Reddy and Andrew Ward (standing seventh to ninth from left) meet with Mans Lanting from ETC India (sixth from left), local farmers and local NGOs to look at a peanut crop in southern India.

lost to white grub each year. Australia also suffers considerable losses of at least $0.5 million a year.

The biology of white grubs differs slightly between countries and in Australia, the plant can still look healthy while the crop underground is being damaged. Damage can only be assessed when digging a plant, rather than pulling it out. (When a harvester pulls out the plant, the damaged section is left in the ground.) In India, the grubs are more aggressive and can destroy whole sections of the crop.

Dr John Rogers led an ACIAR project between 1997 and 2002 on the management of white grubs in peanut cropping systems in Asia and Australia. "In Australia, white grubs do not pose a major threat to the peanut industry: aflatoxin does, and therefore gets top research and development priority," he says. "An insecticide to prevent white grubs in Australian peanuts is known, but it has never been commercially developed. However, it is about to go off-patent so one of the generic pesticide companies will hopefully pick it up."

The first task of Dr Rogers' project – run by QDPI&F with the University of Queensland, Rajasthan Agricultural University in India and ICRISAT – was to gain a better understanding of the biology of the pest.

"Early on we realised that the greatest potential for impact was in southern India, so we focused our efforts there," Dr Rogers says. "We were able to link up with the successful network established in farming communities by the ETC group, a Dutch aid agency which had NGOs already working with farmers at the grassroots level.

"We were able to distribute surveys, collect samples and conduct on-farm experiments through those NGOs. Once we established the levels of infestation, we were able to come up with recommendations on control.

"Many of the farmers knew they had a problem in their crops but they didn't know what it was. We produced a booklet with good photos in English and the three local languages called *Why are my groundnut plants dying?* It was a great success in helping farmers correctly identify white grub and other problems.

"Then we were able to recommend a low-cost chemical control program which suited these growers, who were very poor, with many in debt."

He hopes to see the information more widely distributed using India's new broadband infrastructure. Already 70 per cent of villages in India have access to broadband internet with 670,000 kilometres of cable laid. Plans are for every village to be online by the end of 2007 and to have their own ICT (information and communications technology) knowledge centre.

"I can imagine an Indian peanut grower being able to come into a telecentre and ask a question of NGOs or other farmers in southern India, or even directly to an Australian researcher via the internet and being able to get an answer," he says. "This could be backed up with CD-ROMs, presentations via the internet, farmer support programs on Doordashan (the Indian State TV network) and hardcopy publications to help them identify and manage problems in their crops.

"We've done all the research necessary to manage the problem, but much of that has stayed with the researchers. For a small expense, we can use this new technology to share this knowledge with more than two million farming families in India." ◂