PERSPECTIVES ON PESTS II

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Effects of plant diseases on crop residues used for peri-urban dairy production on the Deccan Plateau

R8339

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Increased milk production in India will require improved yields of higher-quality crop residues for animal fodder. In Andhra Pradesh State, on the Deccan Plateau, groundnut crop residues are the main source of dry fodder for dairy animals. However, the nutritive value of crop residues is often low, and both sorghum and groundnut are susceptible to a number of diseases that reduce production and quality. Additionally, the development of mycotoxins by fungi on the residues is a serious threat to animal health and, through milk, to human health. In an attempt to tackle these constraints, disease-resistant, dual-purpose cultivars have been distributed to farmers, and village-level seed multiplication/distribution systems following integrated management of foliar diseases have been successfully developed. Farmers identified groundnut cultivar ICGV 91114 as outstanding for both grain and haulm production and quality. Farm surveys confirmed the higher yields of the new cultivar, and laboratory analyses and on-farm feeding trials showed improved nutritive value and milk production. The use of ICGV 91114 as part of an integrated disease management strategy will lead to improved food security and increased incomes. To achieve this, farmers must have assured access to good-quality seed. Unlike sorghum, for which the private seed industry can serve as a multiplier of improved cultivars, community-based seed-production systems for groundnut, will need to be established through farmer self-help groups and NGOs in order to achieve widespread seed dissemination.

ISSUES

India has the largest population of ruminants in South Asia, and livestock production is an integral part of mixed farming systems. One of the most important technical constraints to animal production is the inadequate supply of high-quality feed resources throughout the year. As the area of common property resources for grazing continues to decline with increased cultivation and encroachment, dependence on crop residues will increase in importance.

On the Deccan Plateau in Andhra Pradesh, dual-purpose groundnuts are the major source of both pod and crop residues for ruminants. Yields are reduced by fungal diseases (late leaf spot and rust in groundnut; anthracnose and maize stripe virus in sorghum, which is also used as fodder). A further concern is the production of mycotoxins on crop residues by saprophytic fungi (*Aspergillus*, *Fusarium* and *Penicillium* spp.), which present a serious threat to the health of animals and, through contaminated milk, to human health (see R8298, page 143). A previous project (R7346) demonstrated that the integrated use of resistant genotypes and fungicides improved stover/haulm yields and nutritive value in both crops by more than 70%. This project aimed to disseminate a pro-poor integrated disease management strategy, based on superior, resistant, dual-purpose groundnut cultivars, to farmers in the major production area of Anantapur District.

ACHIEVEMENTS

Some 214 farmers from 12 villages in Anantapur participated in rainy-season and post-rainy-season multiplication and distribution of seed of disease-resistant, dual-purpose groundnut cultivars, following integrated management of foliar diseases. Farmer participatory seed multiplication and distribution were undertaken with self-help groups, including women's groups.

Farmers have contributed to village seed banks by returning twice the quantity given to them for planting. Farmers identified the new disease-resistant, dual-purpose ICGV 91114 as the outstanding cultivar for both

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High haulm and pod yields of disease-resistant, dual-purpose groundnut

grain and haulm production and quality. The area under the new cultivars is now some 3000 hectares.

In June 2004, 150 farmers from five villages attended an orientation programme in the local language (Telugu) on the importance of farmer-participatory disease management of dual-purpose groundnuts. Discussions took place on foliar diseases, soilborne diseases, mycotoxin contamination and their management. In January 2005, 140 farmers and staff from national agricultural research systems, NGOs, ICRISAT and ILRI attended a stakeholder workshop on integrated crop/disease management in groundnut. The two meetings attracted considerable interest from the local media, and a number of newspaper reports were published in Telugu.

Surveys of farmers in the project villages indicated that groundnut accounts for 61–77% of the cropped area. Groundnut haulms provide >50% of dry fodder, and >25% of haulm fed to animals is traded within the village. Farmers also purchase substantial amounts of rice straw from 100–150 km away, and small quantities of sorghum straw from nearby villages. Compared with traditional varieties, ICGV 91114 is more resistant to diseases and drought. Mean pod yields for ICGV 91114 are 15% higher than those of local varieties, and mean haulm yields 17% higher. Farmers rated the palatability of the haulm of ICGV 91114, when fed to animals, as superior to that of local varieties. Laboratory analyses of on-farm groundnut haulms confirm that the nutritive value of improved cultivars is high. The ranges for crude protein content, *in vitro* digestibility and metabolisable energy level are 13.9–15.8, 63.2–65.3 and 8.8–9.2 MJ/kg, respectively.

Farmers perceived that foliar diseases reduce pod yields of traditional varieties by 10–20% and haulm production by 20–30%. Farmers observed disease incidence annually, but pest incidence was observed once in two years. The aflatoxin content of 72 groundnut haulm samples from six varieties (ICGS 44, ICGS 11, DRG 12, ICGV 86325, ICGV 92020 and ICGV 92093), from the CPP project on aflatoxins in groundnut (R7809), were analysed by enzyme-linked immunosorbent assay (ELISA). Results indicated that contamination in these samples was in the range 0–33 µg/kg, and about 25% of samples had higher than the permissible level. Among the six cultivars, all 15 haulm samples from ICGV 86325 were contaminated in the range 12–33 µg/kg. In the other cultivars, the level of aflatoxin contamination was very low.

Laboratory measurements of nutritive value were related to animal performance data using simple and multiple regression analyses. Laboratory techniques that predict animal performance were used for the development of near-infrared spectroscopy equations to provide a rapid, non-destructive analytical tool for estimating crop residue feeding value.

In 2003 the groundnut crop on farms was badly affected by drought. In 2004 rainfall was good, and data were available from farmers' crops for economic analysis. Seed is the most expensive input, accounting for 36–42% of total costs. Currently farmers receive about Rs24–28 per kg for seed of ICGV 91114, compared with Rs18–22 per kg for seed of traditional varieties (Rs80 ≈ £1). Per unit production, costs were lower for ICGV 91114 under both irrigated and rainfed conditions. Net returns to farmers were 25–29% higher as a result of growing the improved cultivar. Milk yields per animal on farm were 4.36 kg/day when fed improved cultivars and 3.92 kg/day with local varieties, an advantage of 0.44 kg per animal per day. Some 70–80% of milk is sold through both formal and informal channels, and income from sales ranges from 15–25% of household income.

Demand for seed of ICGV 91114 has exceeded supply. To meet requirements, several farmers with irrigation facilities have begun seed multiplication under guidance from NGOs and project scientists. Concurrently, seed traders have begun multiplying seed of the new cultivar on farmers' fields on a buy-back basis, in anticipation of high demand. The area under improved cultivars is now about 3000 hectares.

FURTHER APPLICATION

As a result of an extension to the project (R8450), it is anticipated that some 18,570 hectares will be under new cultivars by 2006. At current rates of adoption, some 80,000 hectares of groundnut (10% of the total area) will be planted to improved cultivars in Andhra Pradesh by 2010. This would be still higher with further extension of the groundnut-growing area into the neighbouring states of Karnataka and Tamil Nadu.