

Groundnut rosette disease management

R7445

Tim Chancellor, Frances Kimmins
*Natural Resources Institute,
University of Greenwich, UK*

Charles Busolo-Bulafo
*Serere Agricultural and Animal
Production Research Institute
(SAARI), Uganda*

Piet van der Merwe
*International Crops Research
Institute for the Semi-arid Tropics
(ICRISAT), Malawi*

Naidu Rayapati
University of Georgia, USA

July 1999–June 2002

See R6811, *Perspectives on Pests
1996–2000*, p. 27

SELECTED PUBLICATIONS

NAIDU, R.A., KIMMINS, F.M., DEOM, C.M. *et al.* (1999) Groundnut rosette: a virus disease affecting the sustainability of groundnut production in sub-Saharan Africa. *Plant Disease* 83: 700–709.

PAGE, W.W., BUSOLO-BULAFU, C.M., VAN DER MERWE, P.J.A. and CHANCELLOR, T.C.B. (2002) *Groundnut Manual for Uganda: Recommended Groundnut Production Practices for Smallholder Farmers in Uganda*. Natural Resources Institute, Chatham, UK.

SUBRAHMANYAM, P., VAN DER MERWE, P.J.A., REDDY, L.J. *et al.* (2000) Identification of elite short-duration rosette resistant lines in world germplasm collections. *International Arachis Newsletter* 20: 46–50.

VAN DER MERWE, P.J.A., SUBRAHMANYAM, P., KIMMINS, F.M. and WILLEKENS, J. (2001) Mechanisms of resistance to groundnut rosette. *International Arachis Newsletter* 21: 43–45.

Groundnuts are a key crop in eastern Uganda, grown for both food and income. The major factor limiting production is groundnut rosette disease, a virus disease transmitted by aphids. This project built on previous CPP epidemiological research in Malawi which identified new sources of resistance to aphids and to rosette disease. Screening methodologies were developed to enhance the efficiency of groundnut improvement programmes. Working closely with researchers, agricultural extension agents, NGOs and farmers, the project's ultimate aim was to develop sustainable management strategies for groundnut rosette disease, based primarily on the use of improved groundnut varieties with durable resistance to pests and diseases. The availability of new, short-duration, disease-resistant groundnut varieties will assist a substantial number of smallholder farmers to increase their income.

ISSUES

A needs assessment commissioned by DFID in 1998 recognised the importance of groundnuts for both subsistence and income generation, and identified groundnut rosette disease and aphids as serious constraints to production. This project addressed these problems, primarily by developing and promoting groundnut varieties that would combine pest and disease resistance with other key characteristics that are demanded by farmers.

ACHIEVEMENTS

A large-scale household survey was conducted in three districts in the Teso farming system of north-eastern Uganda, and a database was compiled of social and economic data related to groundnut production, including groundnut rosette disease. The survey found that farmers consider several traits when selecting a groundnut variety, including drought resistance, duration, quality characteristics, yield, and pest and disease resistance. Rosette



Rosette-resistant plants (left) improve groundnut yields



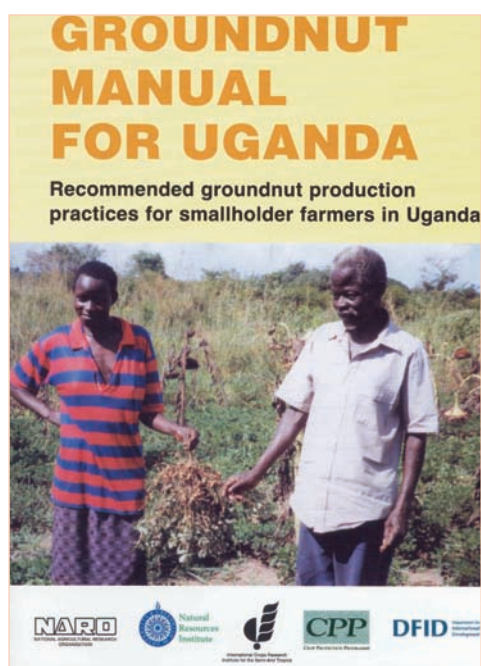
Traditional drying of groundnuts (Soroti)

disease was known by the local name of *atikuba* and the range of available varieties and their qualities were collated. Specific information was fed back into the breeding programme at SAARI and used to refine the criteria used for assessing new breeding lines. Other important survey findings related to how farmers obtain information on farming practices. The information obtained – that very different approaches are needed to reach different categories of farmer – was used to guide the project's dissemination strategy.

The Ugandan Seed Committee approved two high-yielding, short-duration, rosette-resistant groundnut varieties for release within three years of the project's starting in March 2002. The seed of one variety, Serenut 4T (ICG 12991), is tan-coloured and vector-resistant whereas that of Serenut 3R (ICGV-SM 93530) is red and resistant to groundnut rosette virus, so farmers have a wider choice to meet their own and local market requirements. The short duration of the varieties will allow farmers to grow two crops of groundnut a year and thus to enhance their income potential significantly.

These varieties are expected to emulate the success of Serenut 2, released in 1999. Evaluation of the varieties together with other candidate lines in large numbers

of on-farm trials has demonstrated that farmers appreciate their qualities. Serenut 4T was particularly favoured because of the large number of seeds it produces and because it resembles a popular local variety (Erudurudu) in appearance. Complementary



research led to the development of a practical field-based method for evaluating vector resistance in groundnut.

In addition to the field work in Uganda, a PhD programme investigated the mechanisms of resistance in a range of groundnut genotypes. Of particular interest

was a study of Serenut 4T (ICG 12991), which confirmed that it was resistant to the aphid vector through the mechanisms of non-preference and antibiosis. Detailed feeding studies revealed that virus transmission by the aphid vector might be inhibited through the collapse and death of plant cells at the feeding site.

A second PhD programme identified molecular markers linked to the vector resistance gene in ICG 12991, and a basic genetic linkage map for groundnut, the first of its type, was developed.

A *Groundnut Manual for Uganda* (www.cpp.uk.com/outputs.asp) was compiled and 1000 copies distributed to agricultural extension agents and NGO staff and used as a key reference by farmer field schools and extension providers.

FURTHER APPLICATION

Considerable attention was devoted by the project to enhancing the institutional capacity within Uganda to help ensure the gains made from this research will be sustainable. Strong links were forged between SAARI and ICRISAT in Malawi, and a self-sustaining system of groundnut seed multiplication and distribution has been established. A key feature is the role played by NGOs in delivering seed to those farmers who stand to benefit most from growing it. The multiplication rate of groundnut seed is slow and does not attract interest from private seed companies. One of the project collaborators, Appropriate Technology-Uganda (AT-Uganda), has continued this work through a community-based dissemination approach (farmer-to-farmer) transfer of new rosette-resistant groundnut varieties, (R8105, see page 59).

Groundnut rosette disease is a serious constraint to groundnut production throughout West Africa, and a similar approach to the evaluation and promotion of rosette-resistant varieties using the lessons learnt from this project would benefit that region.