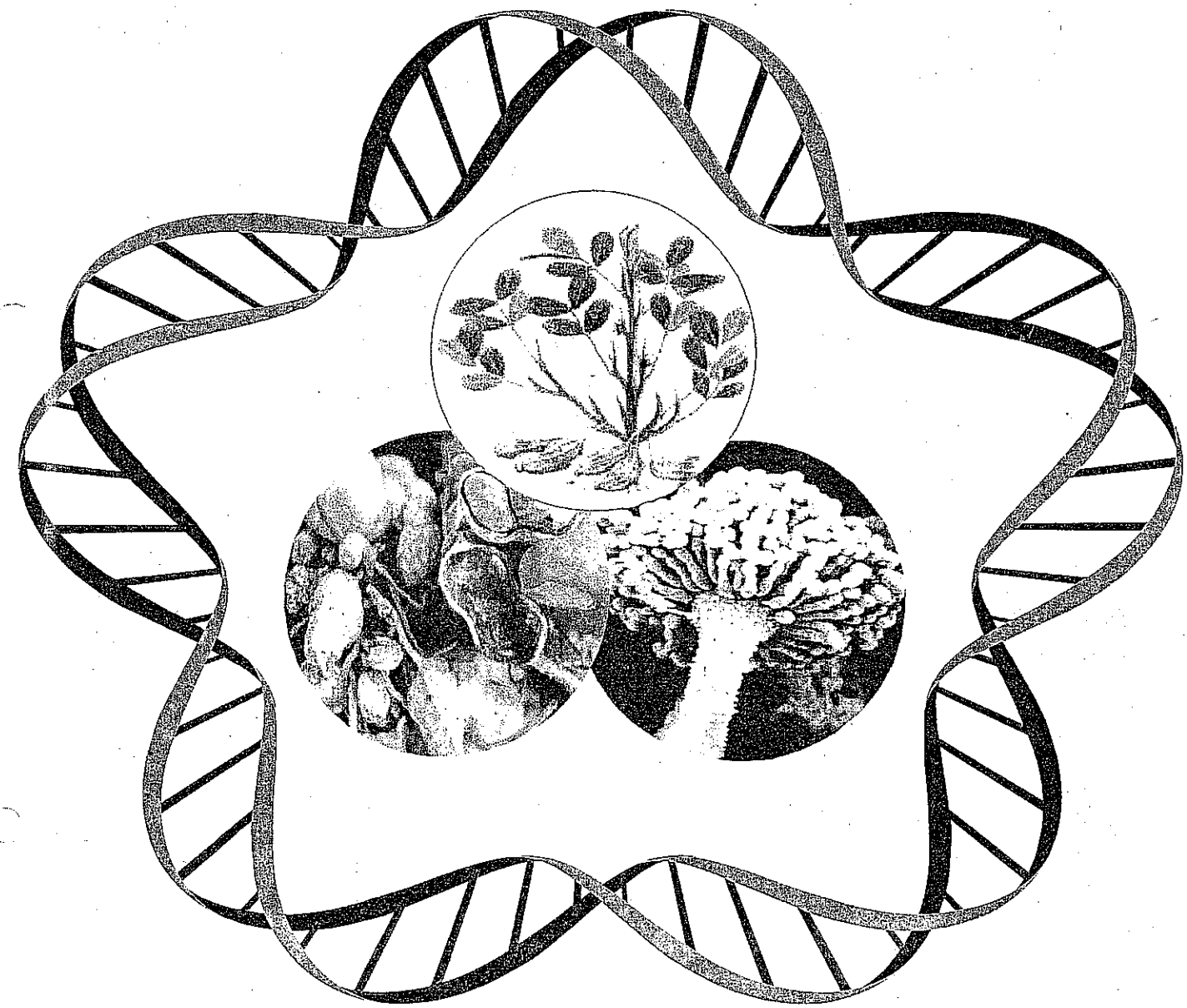
GROUNDNUT AFLATOXIN

Management & Genomics



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Program and Book of Abstract

ICRISAT

Peanut Collaborative Research Support Program

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Aflatoxin resistance breeding at ICRISAT Center

Aruna R, Nigam S N, Waliyar F, Upadhyaya H D, Reddy SV, Reddy Kanaka, Reddy A G S. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru 502 324, AP, India

Groundnut export plays an important role in the national economies of many developing countries. Aflatoxin contamination caused by *Aspergillus flavus* in groundnut hampers export from countries in the semi-arid tropics. Aflatoxin contamination can occur in the field when the crop is growing, during harvesting and curing and in storage and transportation. Research at ICRISAT focuses on identification and utilization of the genetic resistance to pre-harvest seed infection, *in vitro* seed colonization and aflatoxin production by *A. flavus* and pre- and post- harvest management practices (soil amendments, biological control and appropriate drying and curing practices etc.) to reduce aflatoxin contamination in groundnut. We have used 55-437, Tamnut 74, PI 365553 (for resistance to seed infection), PI 337394 F, PI 337409, UF 71513, Ah 7223, J 11, U 4-7-5, Var 27, Faizpur and Monir 240-30 (for resistance to *in vitro* seed colonization) and U 4-7-5 and VRR 25 (for resistance to aflatoxin production) in our aflatoxin resistance breeding program. Improved germplasm (ICGV 88145 and ICGV 89104) with tolerance to *A. flavus* seed infection were identified and released for cultivation. Three lines, ICGV # 87084, 87094 and 87110 were also found resistant to seed infection at Niger, Senegal and Burkina Faso in West Africa. During the 2005/2006 postrainy season, many promising advanced breeding lines have been identified with high levels of resistance to aflatoxin. These are ICGV # 02195 (pod yield = 4.0 t ha^{-1}; seed infection = 0%; aflatoxin production = 0.0 µg kg^{-1}), 02191 (3.1 t ha^{-1}; 0%; 0.0 µg kg^{-1}), 01002 (3.0 t ha^{-1}; 0%; 0.0 µg kg^{-1}) and 01149 (2.6 t ha^{-1}; 0%; 0.0 µg kg^{-1}), ICGV 04051 (3.6 t ha^{-1}; 0%; 1.9 µg kg^{-1}), ICGV 04039 (3.4 t ha^{-1}; 0%; 6.0 µg kg^{-1}) and ICGV 04048 (3.0 t ha^{-1}; 0%; 3.1µg kg^{-1}). However, these results require further confirmation.

The progress in aflatoxin resistance breeding has been tardy due to low level of resistance to different mechanisms of resistance (pre-harvest seed infection, *in vitro* seed colonization and, aflatoxin production) and limitations of the screening techniques. The three mechanisms of resistance are inherited independently. Earlier efforts to combine these mechanisms of resistance to improve the level of resistance to aflatoxin contamination did produce expected results. The search for better sources of resistance in cultivated germplasm is continuing. The recent developments in the area of transgenics (through modification of the aflatoxin biosynthesis pathway or use of variants of hydrolytic enzymes) appear encouraging. Transgenic protection to groundnut against infection by aflatoxin-producing fungi in combination with conventional breeding may help in obtaining agronomically superior groundnuts free of aflatoxin contamination in due course of time.