ducted at adaptive research stations located in four districts—Puri (3 seasons), Cuttack, Sambalpur (3 seasons), and Balasore (1 season). The best performer in these trials was ICGS 44, which was evaluated in 12 such trials; data are shown in Table 2. ICGS 44 was also tested in farmers' fields at three locations during the 1992/93 postrainy season, under residual moisture and irrigation. Pod yields in farmers' fields were 1.59 t ha^{-1} under residual moisture (vs 1.71 t ha^{-1} for AK 12-24), and 3 t ha^{-1} under irrigation.

Stability of performance is a crucial factor in assessing the suitability of new varieties. The stability of all the test varieties (and of four others) in this study was estimated using the method suggested by Eberhart and Russell (1966). Pooled analysis of variance indicated that genotypes (G), environments (E), and G × E interactions were highly significant for pod yield when tested against pooled error, whereas E and E + G × E were significant when tested against pooled deviation. The stability parameters show that OG 52-1 is stable with respect to pod yield (regression coefficient b = 0.98, deviation from regression s^2d = 10.96), while ICGS 11 is stable for seed yield (b = 1.00, s^2d = 2.14), pod yield (b = 1.08, s^2d = −0.14), 100-seed mass (b = 1.01, s^2d = 1.98), and oil content (b = 1.06, s^2d = −0.06). Both varieties are likely to be suitable for cultivation in all seasons. ICGS 44 is stable for shelling percentage (b = 1.05, s^2d = 0.63) and oil content (b = 1.02, s^2d = 1.15), but shows some resistance to environmental changes and is hence better adapted to rainy-season cultivation. It can be also grown with good management in the postrainy/summer season. AK 12-24, the control variety, is sensitive to environmental changes and has below average stability for pod yield (b = 1.40, s^2d = −0.36), although it is stable for oil content (b = 0.96, s^2d = 0.76). It is therefore better adapted to the postrainy/summer season. Similarly, Kisan and Jawan (below average stability for pod yield, stable for shelling percentage, seed index, and oil content) are better suited to high-yielding environments (postrainy/summer season), although they can be grown during the rainy season with proper management, even in drought-prone areas.

The new varieties generally combine high yields with stability in shelling percentage and seed size. They are therefore likely to be good replacements for AK 12-24, and can help stabilize oilseeds production in Orissa.

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Tapioca Pearls—A Potential Substitute for Agar in Microbiological Media

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Agar is an expensive gelling agent that is extensively used in microbiology and pathology laboratories all over the world. It is a complex polysaccharide obtained from marine algae. We tested a range of starch products and identified small-grained, granulated tapioca or tapioca 'pearls' as a cheap substitute for agar in microbiological media.

Two media, chickpea-dextrose-tapioca (CDT) [chickpea *dhal* flour 5 g, dextrose 20 g, granulated tapioca (*Motidana*, no. 2 quality) 150 g, distilled water 1000 mL] and potato-dextrose-tapioca (PDT) [potatoes 200 g, dextrose 20 g, granulated tapioca (*Motidana*, no. 2 quality) 150 g, distilled water 1000 mL] were prepared as described by Nene and Sheila (1994). The effectiveness of the two media was tested with fungal pathogens of groundnut and was also compared with potato-dextrose-agar (PDA), the commonly used medium for most fungi.

Cercospora arachidicola, which causes early leaf spot of groundnut, was successfully isolated from infected leaves on CDT, PDT, and PDA. In growth studies, the three media supported excellent mycelial growth of *Rhizoctonia bataticola* and *Sclerotium rolfsii*, which are important fungal pathogens of groundnut (Fig. 1). However, sclerotial production by the two fungi differed in the media tested. Fewer sclerotia of *S. rolfsii* were produced on CDT and PDT than on PDA (Fig. 2); more sclerotia of *R. bataticola* were produced on PDT than on PDA.

Aflatoxin contamination of groundnut seeds due to colonization by aflatoxigenic strains of *Aspergillus flavus* is a worldwide problem. Czapek Dox agar and its modified formulations have been widely used as routine culture media for *Aspergillus* spp (Raper and Fennell 1977). In laboratory screening tests, groundnut genotypes with resistance to seed infection by *A. flavus* were identified by plating seeds on Czapek Dox-Rose Bengal-streptomycin-agar medium (Mehan and McDonald 1984, Mehan et al. 1986, Mehan 1989). Using the same medium, Mehan et al. (1986) also detected seed infection by *A. niger* in several groundnut genotypes. We tested *A. flavus* and *A. niger* on CDT and PDT. The two media supported as good growth of the fungi as did PDA; however, sporulation of *A. flavus* and *A. niger* was less on CDT and PDT than on PDA. Colonies of *A. flavus* and *A. niger* were observed on modified Czapek Dox tapioca

medium (Nene and Sheila 1994). Our studies indicate that granulated tapioca can be used instead of agar to detect seedborne infection by *Aspergillus* spp.

Tapioca-based media can be used to isolate fungi and bacteria, and for the maintenance and short-term preservation of fungal cultures (Nene and Sheila 1994). The media can also be used in seed pathology studies. Attempts are being made to use granulated tapioca instead of agar in tissue culture media for callus induction in grain legumes.

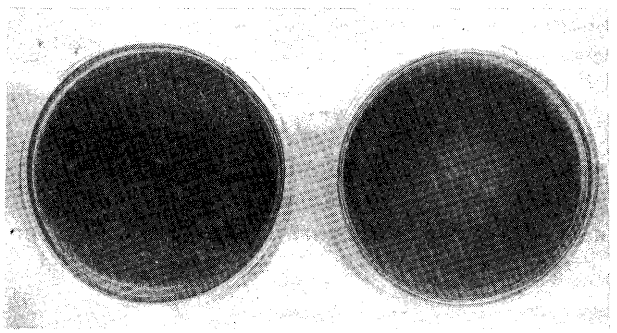

Figure 1. Growth of *Rhizoctonia bataticola* after 4 days on chickpea-dextrose-tapioca (left) and potato-dextrose-agar (right).

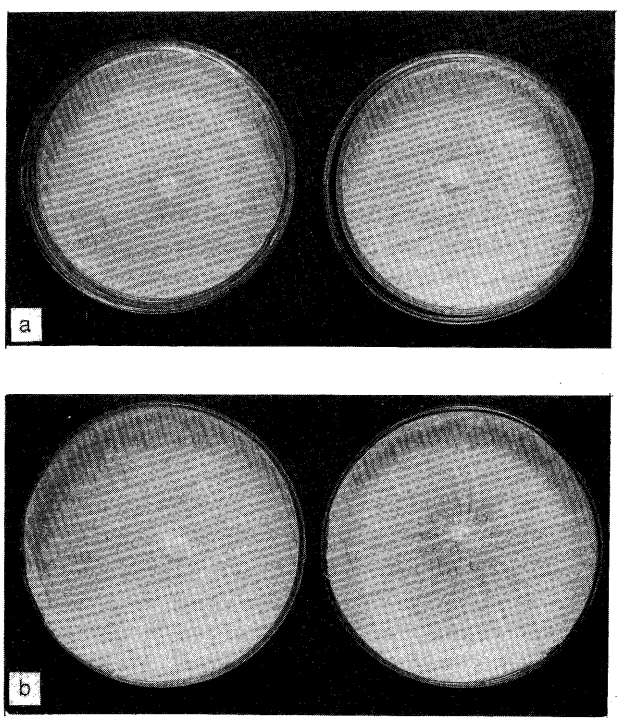

Figure 2. Growth of *Sclerotium rolfsii* after 4 days on: (a) chickpea-dextrose-tapioca (left) and potato-dextrose-agar (PDA) (right); and (b) potato-dextrose tapioca (right) and PDA (left).

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Survey of Groundnut Diseases in Northern Malawi

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Groundnut is the most important leguminous crop grown in Malawi. In the smallholder sector, groundnut is the second most important crop after maize, and provides a supplementary source of income. Until recently, groundnut was Malawi's fourth most important export crop after tobacco, tea, and sugar. However, yields are very low, averaging 700 kg ha^{-1} (unshelled). Diseases are a major constraint to groundnut production in Malawi.