Food Quality

Oil Recovery and Quality as Influenced by Foliar Diseases in Groundnut Genotypes

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About 80% of total groundnut production in India is crushed for the extraction of oil. Hence, improvement in oil yield and quality is of interest to plant breeders and millers. However, the foliar diseases, late leaf spot (*Phaeoisariopsis personata*) and rust (*Puccinia arachidis*), which occur together worldwide can cause considerable loss in yield and quality. This study envisages to evaluate the groundnut genotypes with varying levels of resistance to foliar diseases for oil recovery and quality under rust and late leaf spot epidemics.

The genotypes in the study included one foliar diseases resistant mutant (28-2), two cross derivatives (D39d and B37c) in spanish background, five foliar diseases susceptible cultivars (JL 24, TMV 2, TAG 24, Dh 8, and R 8808), one foliar diseases resistant cultivar (ICGV 86590), and a breeding line (GBFDS 272). They were assessed for oil content, oil yield, and oil quality [(oleic acid/linoleic acid ratio (O/L ratio)], under diseased and protected conditions. The crop was protected by spraying chlorothalonil at 0.2%. Each genotype was raised in five rows of 5 m in length in three replications. Oil content was determined by nuclear magnetic resonance (NMR) technique (Jambunathan et al. 1985). Fatty acid content was estimated following Mercer et al. (1990). From the fatty acid data, O/L ratio was computed. In each genotype, pod yield (t ha^{-1}) was multiplied by shelling out-turn (%) and oil content (%) to derive oil yield (t ha^{-1}).

A significant loss in oil yield but only marginal change in O/L ratio was observed due to foliar diseases (Table 1), which is in conformity with an earlier report (Dwivedi et al. 1993). However, genotypes under diseased condition differed significantly for oil yield, with susceptible cultivars recording very low values.

The foliar diseases resistant mutant and cross derivatives matured early and gave high oil yield as compared to

Table 1. Performance of groundnut genotypes for resistance to foliar diseases, and oil yield and quality at the University of Agricultural Sciences, Dharwad, India, 1998 rainy season[1].

Genotype	Days to maturity	FDS[2]		Oil yield (t ha^{-1})		Shelling out-turn (%)		Oil content (%)		O/L ratio (%)	
		LLS	Rust	P	UP	P	UP	P	UP	P	UP
Mutant	100–105	5	7	1.40ab	1.18b (17)	69.6b	69.1bc	46.6b	44.9b	0.99f	0.96e
D39d	105–110	4	3	1.75a	1.49a (15)	79.0a	78.7a	48.5a	48.0a	1.75a	1.78a
B37c	110–115	4	3	1.62ab	1.22b (25)	76.5a	71.8b	45.0cd	43.1b	1.30c	1.34c
Dh 8	105–110	7	8	1.11bc	0.89bd (20)	68.1b	64.7c	42.7e	40.6c	1.50b	1.36c
R 8808	105–110	8	7	1.42ab	0.92bc (35)	68.7b	69.8bc	44.5cd	40.9c	0.88g	0.90e
JL 24	100–105	8	8	1.23bc	0.70cd (43)	69.8b	67.6bc	44.0cd	43.7b	0.96e	0.96e
TMV 2	100–105	9	9	1.30bc	0.62cd (52)	70.3b	66.3bc	40.4f	39.8cd	1.15d	1.10d
TAG 24	95–100	9	8	1.09bc	0.64cd (41)	70.4b	66.7bc	42.7e	38.3cd	1.07e	0.97e
ICGV 86590	110–115	8	3	1.15bc	0.71cd (38)	59.8c	57.0d	45.2c	39.9cd	0.89g	0.92e
GBFDS 272	120–125	4	2	1.43ab	1.07bc (25)	62.2c	59.4d	46.5b	43.5b	1.50b	1.56b
Mean		–	–	1.35	0.94** (30)	69.5	67.0*	44.6	42.3**	1.20	1.18[3]
CD (5%)		–	–	0.22	0.21	2.8	3.6	1.0	2.0	0.04	0.08
CV (%)		–	–	9.5	13.0	2.3	3.1	1.0	2.4	2.0	4.0

1. P = Protected; UP = Unprotected. Figures in parentheses indicate reduction (%).
   *, ** denote significance of difference between UP and P at 5% and 1% level of probability, respectively.
   Figures with same letters in a column do not differ significantly at 5% level of probability.
2. FDS = Field disease score (1–9 scale), where 1 = 0%, 2 = 1–5%, 3 = 6–10%, 4 = 11–20%, 5 = 21–30%, 6 = 31–40%, 7 = 41–60%, 8 = 61–80%, and 9 = 81–100% damage to foliage; LLS = Late leaf spot.
3. Not significant.

resistant breeding line GBFDS 272. The cross derivative, D 39d, recorded highest oil yield (1.75 t ha^{-1}) with least reduction (15%) due to foliar diseases. Its oil was characterized by high O/L ratio (1.78), revealing better nutritional and keeping quality. Its high oil yield under diseased condition was especially due to high oil content (48%) and shelling out-turn (79%). This genotype could be widely tested for its suitability in commercial cultivation and/or profitably utilized in resistance breeding to improve spanish bunch groundnuts.

References

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Utilization

Wild *Arachis* Species: A Possible Source of Legume Fodder in India

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In India, an annual deficit of about 30% between availability and requirement of forage and fodder has been visualized. In reality, this deficit may be around 40% because forage though potentially available in the country may not be actually available to animals. This is possibly one of the reasons of low productivity of livestock in India. The diversion of other foods or commercial cropped area is not possible for forage cultivation because of preferential human food and other economic compulsions. Under such circumstances, one of the possible ways to bridge the wide gap between demand and supply is to ameliorate the forage resources through management of drylands and/or wastelands by introducing new fodder crops. Hence, the study was undertaken to find out the nutritive value of wild *Arachis* species, which may be introduced as a source of perennial fodder in dryland/wasteland areas.

The wild *Arachis* species have been maintained at the National Research Centre for Groundnut (NRCG), Junagadh, Gujarat, India in a small pasture since last five years. Five accessions of wild *Arachis* species, *A. hagenbeckii, A. prostrata, A. marginata,* and *A. glabrata*, along with three controls were tested in a completely randomized design with three replications. The controls included two cultivated species of groundnut (spanish and virginia types) and wheat. Cultivated groundnut was sown in the end of June 1997 with 1.25 g nitrogen and 2.5 g P_2O_5 m^{-2} and was harvested in the second fortnight of October. Wheat was sown on 19 November 1997 with 12 g nitrogen and 5 g P_2O_5 m^{-2} and was harvested on 7 March 1998. Five plant samples (whole plants) from each species were randomly cut from 5 cm above the ground level to study different nutritive characters as a fodder, viz., dry matter (DM), crude protein (CP), crude fiber (CF), ash, silica, phosphorus (P), potassium, and ether. Collected plant samples were air dried and then kept in an oven at 65±5°C till the samples attained a constant weight. Total dry matter was estimated by deducting dry weight from fresh weight and expressed in percent. Total phosphorus in the samples was determined by Vanadate-molybdate yellow method (Jackson 1973). Ether content was determined by Soxhlet method. The crude fiber, ash, and silica were estimated by treating the fat and mixture-free sample with sulfuric acid (1.25%) and then sodium hydroxide (1.25%). Potassium content in plant sample was determined following neutral 1N ammonium acetate method. Nitrogen content (%) in sample was analyzed by microKjeldahl method and then multiplied with 6.42 to obtain protein content in the samples.

In general, wild species had higher dry matter content than the cultivated species but the differences were not significant (Table 1). Among the wild species, *A. marginata* had the highest dry matter content which was significantly superior over cultivated species. Wild species, in general, had higher crude protein, higher crude fiber, and silica contents than cultivated groundnut. However, wheat straw had maximum crude fiber and silica contents. All the wild species contained low ash and ether as compared