Aspects of Socioecological Studies of Groundnut Soil Pests: Farmers' Perspectives

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Reports by extension and research personnel working with the national agricultural research systems, and incessant complaints by groundnut farmers have continued to send signals on the increasing economic importance of soil pests in groundnut production in Western and Central Africa, and the need for research to be directed towards the development of control measures. The present report is based on responses from interviews with 70 groundnut farmers, and field visits spread across Mali, Burkina Faso, Niger, and Nigeria on their farm histories, cultural practices, control measures during the 1996 cropping season, and the relationship between their responses and field observations on soil pests. Observations on soil pests were made on soil and plant samples taken simultaneously along the diagonals (or transec lines) of each sampled farm.

In the surveyed areas, groundnut is sown sole or as intercrop with cereals and other legumes depending on market and domestic needs of the localities. Farmers in Mali, Burkina Faso, and Niger rated termites as the most damaging soil pest in groundnut production, followed by white grubs and millepedes; most Nigerian groundnut farmers (70%) rated millepedes and termites as the most damaging groundnut soil pest. Sampling for soil pests during surveys also showed the same trends. The termite genera *Microtermes* and *Odontotermes* which damaged groundnut also infested mature sorghum.

The latter factor should be taken into account while designing control measures. Farmers cared less about burning stubbles and stems of cereals after harvest thereby creating a conducive environment for termite spread. White grub, *Schyzonycha* spp and millepede, *Peridontopy* spp were the most common species associated with groundnut damage; cereal components of the intercrop were not affected.

Continuous land cultivation associated with intensive agriculture, as indicated by the number of years a farm was cultivated, slightly reduced termite populations ($r = -0.33$; $P<0.05$), since by tilling the soil a certain proportion of termites are exposed to desiccation and predators. However, because of their subterranean habit, *Microtermes* species can only be significantly reduced by increased depth of tillage, unlike the mound-building species whose nests can be easily destroyed externally. There was no significant relationship between the number of years a farm was cultivated and its white grub or millepede population.

The percentage of interviewed farmers who used compost manure was too low (25%) for any relationship to be computed, despite their complaints of high incidence of white grub being linked to excessive use of manure. However in parts of Kita area in Mali where compost manure was widely used, 67% of farms were infested with white grubs. The use of chemical fertilizer by farmers was low. This was attributed to financial constraints. Farmers in the surveyed localities were not aware of any effect of chemical fertilizer on soil pest damage. However, the role of fertilizers in soil pest management is likely to be in the improvement of plant vigor, making such plants less susceptible to pest attack.

Methods of land clearing across the surveyed areas included slashing (17%), slashing and burning (57%), and plowing weeds under the soil to decay in situ by the use of tractors or by animal traction (26%). Farmers who burn the slashed weeds during land preparation claimed to have reduced soil pest problems. This aspect needs further experimentation since no relationship could be derived between farmers responses and sample data.

Conventional pest control methods such as the use of chemical pesticides is not popular among groundnut farmers of western Africa because of financial constraints. In cases where these were practised, broad-spectrum pesticides were used even when they were not ideal for the target pests. Damage studies showed that the few farms claimed to be treated recorded high soil pest damage, indicating wrong control approaches. Farmers sometimes use chemical pesticides meant for foliar pests and diseases on soil pests, or apply dosages below those recommended by the manufacturers with the aim of economizing for future use. These factors could have contributed to control failures. Farmers estimated yield losses of 10–75% because of soil pests. However, our estimation showed yield losses of 21.1–38%.

The survey shows that termites, white grubs, and millepedes are major production constraints in western Africa. Farmers were helpless, not knowing effective control measures in combating these increasingly menacing pests. Some of their farm practices such as nonremoval of residues of the previous cereal crops, lack of fertilizer application leading to the production of less vigorous plants, the practice of shallow plowing which does not adequately expose some of the soil pests to desiccation and predators also seem to contribute to soil pest abundance and spread.

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Effect of Plant Age on Resistance to Aphids (*Aphis craccivora* Koch) and Rosette Virus in Groundnut

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Rosette, an important virus disease of groundnut in Africa, can be contained by planting resistant groundnut cultivars. Resistance to rosette is most effective (Subrahmanyam et al. 1994) but resistance to the vector *Aphis craccivora* Koch (Padgham et al. 1990) can also lower disease incidence and provide additional protection (Wightman et al. 1990). Plant age can affect host plant resistance. Older plants are generally less susceptible to virus infection and aphid infestation than younger plants (Gibbons and Farrell 1966, Farell 1971). In addition, infected plants may support larger aphid populations than healthy plants.

We tested the effects of plant age and resistance to aphids or rosette disease. The preliminary studies on vector population growth and disease expressions were conducted in greenhouse at Chitedze, Malawi. Five long-duration, virginia type cultivars were used: Chalimbana and CG7 (susceptible to both virus and aphids); RMP 12 and ICGV-SM 90704 (resistance to rosette but resistant to aphids). Three plant ages tested were: 14, 23, and 43 days after sowing (DAS). There were a total of 10 plants for each of treatment, arranged in a split-plot design. The impact of rosette infection on aphid population growth, and the effect of aphid feeding on rosette symptom expression was also tested. Aphid infestation was done in the early morning with a fine painter's brush in groups of three 4th instar nymphs per plant. Viruliferous and healthy aphids were obtained from ICRISAT's stock cultures maintained on a susceptible Malimba cultivar at Chitedze in separate greenhouse. Three days after infestation, the plants with viruliferous aphids were divided into two groups. In one group all plants were sprayed with Actellic® 50EC (pirimiphos-methyl) to kill the aphids; in the other group the aphids were left undisturbed and allowed to multiply. All plants were covered with perforated plastic sleeves (Krisp® bags) and arranged in a single greenhouse. Aphid counts were made every other day from 7th until 25th days after infestation when all plants were sprayed with Actellic® 50 EC. The plastic sleeves were removed and rosette symptom expression was followed for another 15 days. Aphid infestation was expressed as the cumulative total counted from 7 until 25 days after infestation; virus infection as the percentage plants with visual symptoms at 40 days after infection. Temperature varied from 15–35°C; RH from 70–100%. The data were analysed using Genstat® 5 for Windows® 3.2 (Lawes Agricultural Trust, Rothamsted Experimental Station, UK).

Table 1. Cumulative aphid count per groundnut plant at 25 days after infestation, and rosette infection at 40 days after inoculation as affected by plant age and cultivar.

	Cumulative aphid count	Rosette infection treatment (%)
Plant age at infestation (DAS)		
14	2159	47.7
23	1711	50.0
43	1242	36.8
Cultivar		
CG 7	1727	80.7
Chalimbana	1702	78.2
EC 36892	1511	44.4
ICGV-SM 90704	1738	17.9
RMP 12	1707	0.0
LSD (5%)	174	14.8

Plant age. Aphid populations were largest on plants infested at 14 DAS, followed by plants infested at 23 and 43 DAS. Clearly, young plants are physiologically more suitable to aphid development and reproduction than older plants. Rosette infection was significantly lower in the 43 DAS group than in the younger age groups.

Cultivar. Aphid population growth was lowest on EC 36892, an aphid-resistant line. The other cultivars showed