

SUITABILITY OF THREE LEGUMES FOR DEVELOPMENT OF *TETRANYCHUS OGMOPHALLOS* (ACARI: TETRANYCHIDAE)

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Tetranychus ogmophallos Ferreira & Flechtmann is a new tetranychid found on pinto peanut, *Arachis pintoi* (Krap. & Greg.) (Fabaceae), in an experimental field of the Centro Nacional de Pesquisa Agropecuária do Cerrado (EMBRAPA) in Planaltina—DF, Brazil (Ferreira & Flechtmann 1997). Pinto peanut is a Brazilian legume mainly used as a nitrogen fixator in pasture fields or as green manure in tropical crops such as coffee, banana, and oil-palm (Grof 1984, De la Cruz et al. 1994, Suarez-Vasquez et al. 1992). Because of its agronomic characteristics pinto peanut is currently exported from Brazil to other countries of Latin America and to Australia (Asakawa & Ramirez 1989, Vilarreal & Chavez 1991, Cook et al. 1990). Thus, through exports of pinto peanut *T. ogmophallos* could be accidentally introduced into new areas, and is a quarantine issue.

The objective of this work was to compare the suitability of three legumes of economic importance, common bean, *Phaseolus vulgaris* L., peanut, *A. hypogaeae* L., and soybean, *Glycine max* Merrill, as host plants of *T. ogmophallos*. Studies were conducted under laboratory conditions at $26 \pm 0.5^\circ\text{C}$, $75 \pm 10\%$ RH and a photoperiod of 13:11 (L:D). Experiments were carried out using the progeny of about 50 females from the quarantine laboratory of CENARGEN, EMBRAPA, Brasília. Mites were reared on bean leaves in the same environmental conditions as above. To study survival rate, developmental time, and sex-ratio, 4-5 females were placed on the lower surface of a leaf disk (4 cm^2) maintained on water-soaked cotton. After 1 h, females and excess eggs were eliminated to obtain one egg per disk; 70 disks were kept for each treatment. The disks were monitored three times a day (at 7 a.m., 1 p.m., and 7 p.m.) until adult emergence. For oviposition study, one female teliochrysalis (last pre-imago instar) and two males were placed on a leaf disk and the males were removed 48 h after

the female had emerged. The number of eggs laid per female was monitored daily. The disks were changed every 4 days. Thirty females were followed per legume. Demographic parameters (net reproductive rate, R_0 , generation time, G , and intrinsic rate of natural increase, r_m) were determined using a program developed by Hulting et al. (1990). Biological parameters (survivorship, developmental time, fecundity, and longevity) were compared between treatments using a one-way ANOVA (LEAS 1989). If ANOVA revealed significant differences, means were compared using the Scheffé method. R_0 and r_m were compared using the SNK test (Hulting et al. 1990).

Development from egg to adult occurred on all three plant species tested. Developmental time (Table 1) recorded on peanut was significantly different than those recorded on common bean and on soybean ($F = 108.16$; $df = 2-144$; $P < 0.0001$). On each plant species, $85 \pm 5\%$ of eggs reached adult stage, with no significant differences between treatments. The sex-ratio was 80% female for all 3 legumes.

Longevity in days for adult females differed significantly among host plant (Table 1) ($F = 21.7$; $df = 2-79$; $p < 0.05$). The highest total fecundity was obtained on common bean ($F = 24.9$; $df = 2-79$; $p < 0.05$), whereas no significant difference was found between peanut and soybean.

The R_0 calculated on common bean was significantly higher than R_0 obtained on soybean ($q = 3.6$, $df = 3, 19$; $p < 0.05$) and on peanut ($q = 4.1$, $df = 3, 19$; $p < 0.05$). No significant difference was found between the latter two legumes ($q = 0.5$, $df = 3, 19$; $p > 0.05$) (Table 1).

The r_m values differed significantly between host plants. The highest r_m was obtained on common bean ($q = 8$ with soybean and 7.3 with peanut, $df = 3, 19$; $p < 0.05$) and the lowest on peanut ($q = 4.1$ with soybean, $df = 3, 19$; $p < 0.05$) (Table 1).

Results of the present study indicate that *T. ogmophallos* is not only able to develop on common bean, soybean, and peanut, but displayed high rates of increase when reared on these three plants. Values of the biological and demographic parameters were in the range observed for other *Tetranychus* spp. under similar environmental conditions (Gutierrez 1976, Carey & Bradley 1982, Tsai et al. 1989, Rai et al. 1995).

Because tetranychids are polyphagous and *T. ogmophallos* showed high rates of increase when reared on these three different plants, it seems reasonable to speculate that *T. ogmophallos* also could develop on a wide range of hosts. Thus, further investigations are needed in order to precisely characterize this range.

TABLE 1. BIOLOGICAL AND DEMOGRAPHIC PARAMETERS OF *TETRANYCHUS OGMOPHALLOS* ON 3 PLANT SPECIES AT 26°C, 75% RH, AND 13:11 L:D.

Parameters	Arachis hypogaeae	Glycine max	Phaseolus vulgaris
Developmental time ¹ (egg to adult)	14.2 ± 0.2	11.9 ± 0.8	11.7 ± 0.4
Total fecundity	60.0 ± 2.9	63.9 ± 5.7	104.3 ± 7.8
Longevity of females ¹	16.5 ± 0.8	15.4 ± 1.2	25.3 ± 1.1
Mean generation time ¹ (G)	20.1	18.9	20.7
Net reproductive rate (R_0)	41.05 ± 2.0	45.7 ± 4.1	75.9 ± 4.9
Intrinsic rate of increase (r_m)	0.190 ± 0.003	0.215 ± 0.001	0.232 ± 0.004

Means are followed by ±SE.

¹Days.

SUMMARY

The suitability of common bean, *Phaseolus vulgaris*, soybean, *Glycine max*, and peanut, *Arachis hypogaeae*, as food substrates for the mite *Tetranychus ogmophallos* was evaluated. The mite performed better on common bean ($r_m = 0.232$) although it developed and reproduced well on soybean ($r_m = 0.215$) and peanut ($r_m = 0.190$).

REFERENCES CITED

- ASAKAWA, N. M., AND R. RAMIREZ. 1989. Inoculation and planting methodology for *Arachis pintoi*. *Pasturas Tropicales* 11: 24-26.
- CAREY, J. R., AND J. W. BRADLEY. 1982. Developmental rates, vital schedules, sex-ratios and life tables for *Tetranychus urticae*, *T. turkestanii* and *T. pacificus* (Acarina: Tetranychidae) on cotton. *Acarologia* 23: 333-345.
- COOK, B. G., R. J. WILLIAMS, AND G. P. M. WILSON. 1990. *Arachis pintoi* Krap. et Greg. nom. nud. (pinto peanut) cv. Amarillo. *Australian J. Exp. Agric.* 30: 445-446.
- DE LA CRUZ, R., S. SUAREZ, AND J. E. FERGUSON. 1994. The contribution of *Arachis pintoi* as a ground cover in some farming systems of Tropical America, pp. 102-108. In P. C. Kerridge, and B. Hardy [eds.] *Biology and agronomy of forage Arachis*. Centro Intern. Agric. Trop. Pub. 240, Cali, Colombia.
- FERREIRA, D. N. M., AND C. H. W. FLECHTMANN. 1997. Two new phytophagous mites (Acari: Tetranychidae, Eriophyidae) from *Arachis pintoi* from Brazil. *Syst. Appl. Acarol.* 2: 181-188.
- GROF, B. 1984. Forage attributes of the perennial groundnut *Arachis pintoi* in a tropical savanna environment in Colombia. In *Proc. International Grassland Congress*, 15., Kyoto, 1985. Centro Intern. Agric. Trop. Cali, Colombia, p. 168-170.
- GUTIERREZ, J. 1976. Etude biologique et écologique de *Tetranychus neocaledonicus* André (Acarien: Tetranychidae). *Cahiers Orstom*. Paris.
- HULTING, F. L., D. B. ORR, AND J. J. OBRYCKI. 1990. A computer program for calculation and statistical comparison of intrinsic rates of increase and associated life table parameters. *Florida Entomol.* 73: 601-612.
- LEAS. Logiciels d'Enseignement et d'Analyses Statistiques. 1989. Chaire de Mathématiques. Unité de Biométrie de l'Ecole Nationale Supérieure Agronomique de Montpellier France.
- RAI, A. B., A. S. SEJALIA, C. B. PATEL, AND S. KUMAR. 1995. The rate of natural increase of red spider mite when reared on okra. *Gujarat Agricul. Univ. J.* 21: 130-136.
- SUAREZ-VASQUEZ, S., M. WOOD, AND S. NORTCLIFF. 1992. Crecimiento y fijación de nitrógeno por *Arachis pintoi* establecido con *Brachiaria decumbens*. *Cenicafe* 43: 14-21.
- TSAI, S. M., K. S. KUNG, AND C. I. SHIH. 1989. The effect of temperature on life history and population parameters of Kanzawa spider mite, *Tetranychus kanzawai* Kishida (Acarina: Tetranychidae) on tea. *Plant Protect. Bull. Taiwan* 31: 119-130.
- VILARREAL, M., AND O. CHAVEZ. 1991. Adaptación y producción de gramíneas y leguminosas forrajeras en San Carlos, Costa Rica. *Pasturas Tropicales* 13: 31-38.