ANTIOXIDANTS FOR CORNCOB GRIT-SOYBEAN OIL BAIT USED TO CONTROL IMPORTED FIRE ANTS (HYMENOPTERA: FORMICIDAE)[1]

—(*Note.*) Antioxidants were evaluated for their potential for retarding the development of rancidity, a major factor affecting field life of fire ant bait. In a modification of the method of Lofgren et al. (1961. Imported fire ant toxic bait studies: the evaluation of various food materials. J. Econ. Ent. 45: 1096-1100), fire ants were offered blotting paper saturated with soybean oil (SBO) with and without antioxidants in replicated feeding tests. Concentrations of antioxidants in the SBO ranged from 2.0 to 0.25% depending on acceptance. Antioxidants that were unacceptable to the ants (50% reduction in feeding) included: *p*-phenylenediamines (*N,N'*-dicyclohexyl-, *N*-octyl-*N'*-phenyl-, and *N,N'*-bis(1-ethyl-3-methylpentyl)-); *N*-nitrosodiphenylamine; 1,2-dihydro-6-ethoxy-2,2,4-trimethylquinoline; polymerized trimethylquinoline; 4'-hydroxydodecananilide; 4,4'-(2,3-dimethyltetramethylene)dipyrocatechol; *p*-(benzyloxy)phenol; 3,4-(methylenedioxy)phenol; 2,4,6-tris[(dimethylamino) methyl]phenyl; α-(dimethylamino)cresol; CAO-42("alkylated cresols"); and dimethyl, diethyl, or dibutyl phosphites.

The rest of the antioxidants were subjected to an accelerated oxidation treatment involving exposure in SBO to high intensity UV (545 microwatts/cm^2 of 320-400 mμ at 45.6 cm) and high temperature (88°C). Formulations with a low peroxide value (Anon. 1967. Active oxygen method for comparing fat and oil stabilities. Tech. Data Sheet G-159, Eastman Chem. Prod., Inc., Kingsport, Tenn.) were then tested for acceptability to the ants. Four hundred g lots of each formulation were exposed on sand for 24, 48, and 72 hrs to natural weathering, after which 50 g samples were offered to field colonies (5 replicates). The formulations all contained Calco® N-1700 red dye in lieu of mirex, and acceptability was measured as the percentage of ants containing dye after 24 hrs.

Antioxidants acceptable to the ants but with high peroxide value after the accelerated oxidation test included: propyl gallate; butylated hydroxyanisole (butylmethoxyphenols); 6-*tert*-butyl-2,4-xylenol; 2,6-di-*tert*-butyl-*p*-cresol; 2,6-di-*tert*-butyl-α-(dimethylamino)-*p*-cresol; 4,4'-methylenebis[2,6-di-*tert*-butylphenol]; 2,2'-methylenebis[6-*tert*-butyl-*p*-cresol]; 4,4'-thiobis[6-*tert*-butyl-*o*-cresol]; 4,6-dinonyl-*o*-cresol; *α,α',α''*-(2,4,6-tetramethyl-*s*-phenyl)tris[1,6-di-*tert*-butyl-*p*-cresol]; dioctadecyl 3,3'-thiodipropionate (secondary antioxidant and synergist); triisooctyl phosphite; Mark 1089 ("a substituted thiobisphenol C_{13} alkyl phosphite"); Hallcolife Ultra ("a hindered phenol based on wood rosin"); and various proprietary formulations of commercial antioxidant or other protective agents (Endox-0 ®; Tenox S-1® and Tenox 7®; Topanol AN®, Irganox 858®; Wytox 345® and Wytox 450®).

Antioxidants not acceptable even though the peroxide value was low included *N,N*-dioctyl-*p*-phenylenediamine; cadmium diamyldithlocarbamate; zinc bis(diphenyldithiocarbamate); zinc dibutyldithiocarbamate; Plastinox 1161 ® ("a hindered phenol").

Only mono-*tert*-butylhydroquinone warranted testing in bait formulations. None of the formulations with this material was superior to the controls in field tests, but mono-*tert*-butylhydroquinone may provide protection against rancidity if used in alternative formulations (alternative coatings and/or in conjunction with UV light absorbing compounds). Further evaluation of antioxidants has been suspended indefinitely due to priority of other research problems. The sources of these antioxidants and more detailed results of the tests are available from the authors D. P. Jouvenaz, W. A. Banks, C. S. Lofgren, and D. M. Hicks, Insects Affecting Man Research Laboratory, Agricultural Research Service, USDA, Gainesville, Florida 32604.