Some Inorganic Compounds as Sprays: Their Effects on Insect Biology on **Arachis hypogaea** L.[1,2]

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ABSTRACT

Inorganic compounds containing plant nutrient elements sprayed on peanut, **Arachis hypogaea** L., foliage affected antibiosis expressions of the plant to feeding by the fall armyworm, **Spodoptera frugiperda** (J. E. Smith).

Key words: Groundnuts, insect resistance, nutrient sprays, peanut, **Spodoptera frugiperda** (J. E. Smith).

Host plant resistance expressions to insect attack have been shown to be importantly altered by varying environmental nutrition (via fertilization) of the host plant. The variation has been shown to alter resistance expressions in a number of crop plant species, including the cultivated peanut, *Arachis hypogaea L.* (2-7). Because resistance expressions can thus be altered, the effects of plant nutrients in fertilizer suggest that host plant nutrition is an important factor, previously unconsidered, in plant resistance to insect pests.

The purpose of this investigation was to examine the effects of some inorganic compounds (containing plant nutrient elements), sprayed on peanut foliage, on the biology of the foliage-fed fall armyworm, {*Spodoptera frugiperda* (J. E. Smith)}. The sprayed compounds similarly applied were shown to alter feeding preferences of the insect (4). Adverse effects on the biology of the fall armyworm fed treated foliages compared to untreated plants can be considered to be induced antibiosis expression effects of host plant resistance. Such effects could greatly affect insect population dynamics and control of the insect associated with a particular host.

Methods and Materials

An insect-susceptible peanut cultivar, Tifspan (1), was planted in the greenhouse in washed sand in 6-inch diameter pots and fertilized with 500 lb/acre of 5-10-15. After 6 weeks of growth, 6 plants were atomizer-sprayed (foliage) with each of 5 selected inorganic compounds: sodium borate, ammonium sulfate, magnesium oxide, iron chelate (10%), and sodium chloride. Sodium chloride was applied in a water solution at 1000 ppm. The other 4 compounds were each applied in 10-ppm dilutions per 25-gal water. In addition, 6 pots were unsprayed. In another investigation (7), ammonium sulfate, sodium chloride, and magnesium oxide sprayed on foliage caused the foliage to be nonpreferred for feeding by the larvae. Sodium borate and iron chelate sprays were intermediate in preference for feeding.

Larvae fed the foliages were caged individually (6 groups of 10 larvae/treatment feeding), and life cycle data were recorded. Mean response data for the groups of 10 larvae are given within standard errors of the respective means.

Results and Discussion

Insect responses from the sprayed peanut foliages are presented in Table 1. Shown are variation in 10-day-old larval weight gains, percentages of larval mortality/spray treatment, number of days to pupation, associated pupal weights, and respective days to adult emergence. Variation was also shown in the number of adults emerged of the total 1st-instars used to initiate feeding with respective percentages of 90.0, 82.5, 65.0, 47.5, 70.0, and 80.0.

Table 1. Five inorganic compound solutions and their effects as sprays on peanut foliage on the biology and life cycle of fall armyworm larvae fed the foliage.

Solutions of	10-day larval weight gains (mg)	Larval mortality (%)	Days to pupation	Pupal weights (mg)	Days to adult emergence
Sodium borate	63.7±4.8	2.5±0.9	20.3±0.3	210.4±3.5	24.6±0.3
Ammonium sulfate	41.6±3.8	5.0±1.1	21.0±0.3	196.0±3.4	30.0±0.3
Sodium chloride	37.8±3.6	17.5±4.8	22.2±0.4	193.7±4.2	30.3±0.3
Magnesium oxide	27.1±3.4	20.0±5.8	22.3±0.3	191.5±4.0	31.1±0.4
Iron chelate	25.0±2.3	17.5±6.3	23.0±0.4	200.1±4.0	32.2±0.2
Unsprayed	76.8±6.4	7.1±4.2	19.4±0.2	217.6±5.1	28.5±0.3

These data show that antibiosis expressions are effected in the fall armyworm by sprays of the compounds (containing plant nutrients) applied to peanut foliages. Sprays did not adversely affect appearance or growth of the foliages. Four of the compounds, ammonium sulfate, sodium chloride, magnesium oxide, and 10% chelated iron, greatly inhibited larval weight gain and thus caused this susceptible peanut cultivar to express antibiosis. Compound effects are further emphasized as shown (when compared with unsprayed foliage effects) by extended days to pupation, reduced pupal weights, and increased larval mortality and extended days to adult emergence. Although many of these effects would not occur if larvae were given free choices of the treated foliages (as in a diverse agroeco system), the compound sprays

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[2]Mention of a proprietary product in this paper does not constitute an endorsement of the product by the USDA.

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used may be used to alter or induce preferences for the foliages and in a monoculture affect antibiosis expressions thus altering insect population dynamics.

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