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In vitro evaluation of insecticidal seed treatments on groundnut, *Arachis hypogea* L.

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Abstract
The protection of developing seedlings from insects, diseases, and pests begins with seed treatment. Under most ambitious effort, Total Seed Treatment Campaign 2007, the Indian government offers recommendations for seed treatment for a variety of crops. To confirm the harmful effects of test dosages for the groundnut crop, laboratory studies using three insecticides—imidacloprid (600 FS), fipronil (5FS), and chlorpyriphos (20 EC)—were conducted using the in between paper technique. In our study, the germination percentage for all test-insecticide dosages was more than 70% (range: 74.13% for chlorpyriphos at 25 ml/kg to 96% for imidacloprid at 5 ml/kg). However, with greater dosages of chlorpyriphos and fipronil, additional seedling characteristics (total seedling length and vigour indices) were impacted (P0.05). Imidacloprid did not negatively affect seedling development at any of the three test dosages, but rather may have a phytotonic impact. In short, it was discovered that seed treatment with imidacloprid at levels of 3–7, fipronil at 5, and chlorpyriphos at 6 ml/kg seeds was safer and advised for groundnut crops. These rates of seed-treatment might be tested for additional validation under field in order to reduce pest insects that are of concern.

Keywords: *Arachis hypogea*, fipronil, imidacloprid, seed treatment, and chlorpyriphos L

Introduction
The protection of developing seedlings from insects, diseases, and pests begins with seed treatment. Under most ambitious effort, Total Seed Treatment Campaign 2007 (www.ppqs.gov.in), the Indian government offers recommendations for seed treatment for a variety of crops. In India, the application of seed treatments to field crops has significantly grown in recent years. Treatments applied to seeds offer protection against termites and other sucking insects including the shoot fly, aphids, and jassids in some areas. The majority of the time, recommendations for seed treatment are made based on field experiments; but, in rare instances, solely *in vitro* (=laboratory) studies are used as the basis for recommendations. This issue was addressed in our inquiry; groundnut crop *in vitro* investigations were conducted.

Materials and Methods
NRC for Groundnut, in Junagadh (Gujarat), provided groundnut seeds (var. TAG-21). As per the Table 1, the seeds were given three separate dosages of each of the following: chlorpyriphos 20 EC (Dursban®), fipronil 5 SC (Regent®), and imidacloprid 48% FS (Gaucho® 600 FS). The test also included water as an untreated control. Insecticides were initially mixed with water to create the final amount needed to soak one kilogram of seed, which varied from 50 to 100 ml depending on the kind of crop. The necessary amount of the insecticide emulsion was then sprinkled over the seeds, which were then stirred often to achieve equal seed coating. The seeds were initially spread out on plastic trays. After 24 hours, a germination test was performed on the treated seeds.

By putting the seeds in folded envelopes that were positioned vertically in the germination chamber, the seeds were allowed to sprout between two layers of germination paper. According to ISTA's advice, the chamber's temperature was kept constant at 20 1 °C during the germination time. 100 seedlings from each treatment were sowed in the paper towel three times. According to ISTA (2008) [2], seedlings that were normal, aberrant, and ungerminated were counted 10 days after seeding. Ten seedlings were chosen at random, and their plumules, radicles, and overall lengths were measured.

Ten seedlings from each replication were observed to have mean values for (a) radicle and plumule length; and (b) dry weights (dry weight obtained after 24 hours in oven). These steps are used to determine vigor indices (VI):

Germination% x Mean root and shoot length (cm) is how you calculate the vigor index (I).

Germination% x Mean dry weight (g) = Vigor Index (II)

One factorial ANOVA was performed on the data using the industry-standard statistical software (OPSTAT online, www.hau.ernet.in/opstat.html).

Results and Discussion

Table 1 show how different chemical seed treatment (imidacloprid, fipronil, and chlorpyriphos, each at three dosages) affected percent seed germination, the length of seedlings, and the vigor indices on the seed germination of groundnut crops.

The minimum seed germination rate for groundnuts, according to ISTA, is 70%. In our study, the germination percentage for all test-insecticide dosages was more than 70% (range: 74.13% for chlorpyriphos at 25 ml/kg to 96% for imidacloprid at 5 ml/kg). However, with greater dosages of chlorpyriphos and fipronil, additional seedling characteristics (total seedling length and vigour indices) were impacted (P0.05). Imidacloprid did not negatively affect seedling development at any of the three test dosages, but rather may have a phytotonic impact.

The total length of the seedling in the control group was 24.07 cm, but when it was treated with imidacloprid, it still grew longer in all three doses, with a relative increase in dosage that ranged between 25.1 cm for the lower dose to 28.3 cm for the higher dose. However, compared to the control, all dosages of fipronil and chlorpyriphos significantly reduced the length of the seedlings, and it was shown that the overall length of the seedlings decreased when the dose was increased.

When imidacloprid is used, an increase in dosage causes a relative rise in both vigor indices, according to a detailed examination of the data. As compared to the control values (2420.4 and 72.08, respectively), vigour indices I and II were observed in seed treatments as follows: greatest for imidacloprid @ 7 ml/kg (2778.33, 84.33); lowest for chlorpyriphos @ 25 ml/kg (783.02, 27.66).

There is a dearth of data on other groundnut growth characteristics as well as the *in vitro* evaluation of insecticidal seed treatments. Narasimhulu and Kameswara Rao reported on the effects of chemical seed treatments on groundnut germination in 1989.

Because of the rapid rate of imbibition, higher conductivity of seed leachate, rate of seed respiration, and higher dehydrogenase activity, which reflect vigor of the seed as an effected by seed treatment as experimentally described by Chaudhary *et al*. (2001) [1], the suppression of germination and subsequent growth by pesticide treatments indicates that some of the biochemical processes taking place during germination.

Chlorpyriphos (@ 9 ml/kg) strongly suppressed the germination in both *in vitro* and pot culture, according to laboratory tests (Sithik, 2012) [5]. According to the findings of our investigation, seed treatments with test dosages of fipronil at 7, 10 ml and chlorpyriphos at 12, 25 ml/kg were harmful to the groundnut crop's seedlings.

Sithik (2012) [5] examined the economics of pest management for several seed treatments using the recommended doses for a few pesticides. The most economical product was determined to be chlorpyiphos (20 EC @ 4.5 ml/kg), followed by fipronil 5SC @ 6 ml/kg (Rs. 883) and imidacloprid 17.8SL @ 3.5 ml/kg (Rs. 1024).

Table 1: Germination percentage, seedling length and vigour indices for various seed-treatments (insecticides/termiticides only) in groundnut var. 'TAG-21'

Treatments details	Germination (%)	Root length (cm)	Shoot length (cm)	Total length (cm)	Vigour Index-I	Vigour Index-II
T_1: Imidacloprid (@ 3ml/kg seed)	94.57_{ab} [76.86]	10.80_{b} (3.48)	13.30_{b} (3.81)	25.10_{b} (5.11)	2484.08_{b}(48.95)	70.04_{d} (8.39)
T_2: Imidacloprid (@ 5ml/kg seed)	95.00_{ab} [77.45]	12.20_{b} (3.67)	13.90_{b} (3.89)	27.10_{a} (5.29)	2687.47_{a}(50.93)	76.76_{b} (8.78)
T_3: Imidacloprid (@ 7 ml/kg seed)	94.17_{b} [76.27]	12.47_{a} (3.70)	14.83_{a} (4.00)	28.30_{a} (5.41)	2778.33_{a} (51.81)	84.33_{a} (9.19)
T_4: Fipronil (@ 5 ml/kg seed)	92.33_{c} [74.02]	9.43_{c} (3.28)	11.60_{d} (3.59)	22.03_{c} (4.80)	2139.53_{c} (45.37)	68.38 $_{e}$(8.29)
T_5: Fipronil (@ 7 ml/kg seed)	85.77_{d} [67.65]	8.33_{de} (3.12)	9.90_{e} (3.35)	19.23_{d} (4.51)	1745.47_{e} (40.91)	55.98_{f} (7.51)
T_6: Fipronil (@ 10 ml/kg seed)	83.50_{e} [65.80]	7.63_{e} (3.0)	7.70_{f} (3.01)	16.33_{e} (4.18)	1454.87_{f} (37.28)	50.83_{h} (7.17)
T_7: Chlorpyriphos (@ 6 ml/kg seed)	85.83_{d} [67.7]	8.83_{cd} (3.10)	11.33_{d} (3.55)	21.17_{c} (4.71)	1914.75_{d} (42.88)	53.42_{g} (7.34)
T_8: Chlorpyriphos (@ 12 ml/kg seed)	78.17_{f} [63.82]	6.10_{f} (2.75)	6.10_{g} (2.75)	13.20_{f} (3.8)	1114.7_{g} (32.54)	34.63_{i} (6.05)
T_9: Chlorpyriphos (@ 25 ml/kg seed)	73.13_{g} [58.41]	4.50_{g} (2.45)	4.20_{h} (2.39)	9.70_{g} (3.32)	783.02_{h} (27.17)	27.66_{j} (5.35)
T_{10}: Control (Water)	95.53_{a} [78.01]	10.57_{c} (3.44)	12.50_{c} (3.71)	24.07_{b} (5.01)	2410.40_{b} (48.2)	71.08_{c} (8.45)
S.E(d)	0.67	0.056	0.03	0.061	0.60	0.025
CD (P=0.05)	[1.41]	(0.10)	(0.08)	(0.12)	(1.28)	(0.053)

Figures in parentheses [ ] are arcsine-transformed values and in parentheses ( ) are square root transformed values. Figures are mean of 3 replicates (each replication=100 seeds). Figures in the same column followed by the same lowercase letters are not significantly different (P=0.05)

Conclusion

The most often used chemical is chlorpyriphos since it is less expensive and frequently available to farmers, however it is obvious that this chemical has severe adverse effects. Therefore, field suggestions must be made with the necessary safety measures.

References

1. Chaudhary OP, Kashyap RK, Dahiya BS, Arya B. Varietal sensitivity to insecticidal seed treatment and germination inhibition in wheat. Seed Research. 2001;29(2):189-196.
2. ISTA. International Seed Testing Rule, 2007. Published by International Seed Testing Association, Zurich, Switzerland; c2007.
3. Narasimhulu T, Kameshwara Rao P. Effect of seed treatment with insecticides and fungicides on the germination of peanut seed. Seed Research. 1989;17(2):159-163.
4. OPSTAT online, www.hau.ernet.in/opstat.html

5. Sithik LM, Mahapatro GK. Effective seed treatment for termite control in wheat. In: 13th AZRA Conference on Applied Zoological Researches for National Food Security & Environmental Protection. CRRI, Cuttack, Odisha, 15-16 Feb 2012; c2012.
6. www.ppqs.gov.in/seedtreatment.html (accessed on 27-11-2011)