Agri. Res. J. Kerala, 1972, 10 (2): *152-156*

EFFECT OF SEED TREATMENT WITH SYSTEMIC INSECTICIDES ON THE GERMINATION OF PADDY AND THE GROWTH OF SEEDLINGS

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Seed coating with systemic insecticides have been proved effective against a wide range of crop pests (Reynolds 1958), The reported work on the effect of seed treatment on paddy is very limited. Thorough knowledge on the effect of tretment on the germination of seeds and the growth of seedlings is essential in choosing desirable insecticides for such experiments. Twelve insecticides were screened in the laboratory for this purpose and the results are reported here.

Materials and methods

'Thriveni' an improved variety of rice was used in the experiments. Formothion, ekatin, dimethoate, monocrotophos, phorate, and phosphamidon as emulsion concentrates and carbofuran, sevidol, phorate, cytrolane, solvirex and paddigard as dusts (prepared by grinding the granules and passing them through 100 mesh sieve) were the insecticides used.

Twenty gramme samples of paddy seeds were taken in one pound flat bottom wide mouthed bottles. Required quantities of insecticides were weighed to give the equivalents of 4, 2, 1, 0. 5, 0.25, and 0.125g of active ingredient per 100 g of seed. The emulsion concentrate taken for each treatment was made up to a volume of 1.6 cc with water. This quantity was just enough to give a thorough and uniform coating for the seeds used in each lot. Five such lots treated with water alone served as control The seeds to be treated with dusts were smeared with water to ensure a uniform distribution of the material. All the insecticides added were thoroughly mixed with the seeds in bottles. In the case of seeds coated with dusts 0.6 ml each of a sticker made up of equal volumes of glycerol. water and rectified spirit (Ruppel, 1971) was addei. Five such lots treated with sticker alone served as control. The treated seeds were spread on polythene sheets and dried under an electric fan.

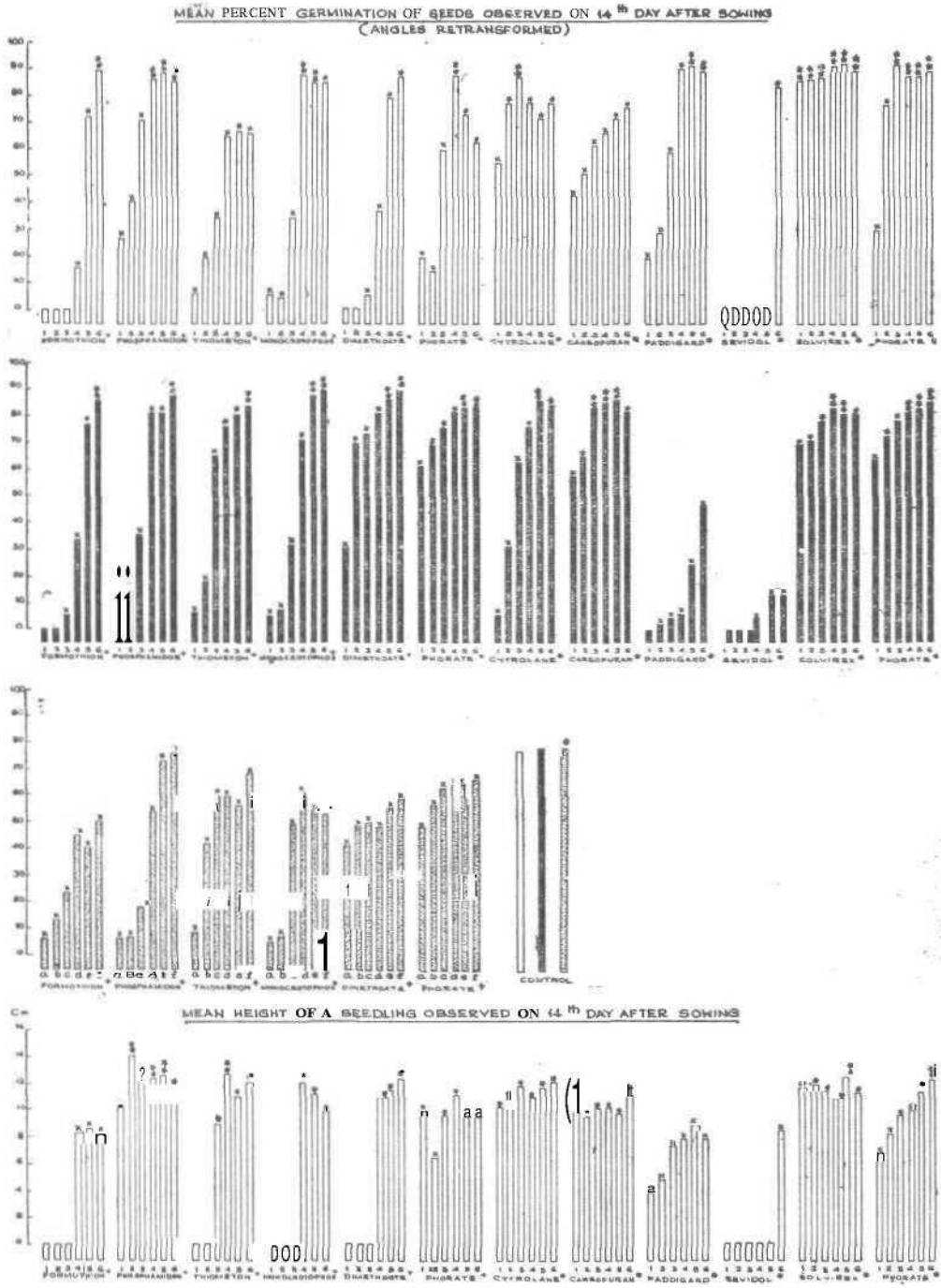
One hundred seeds from each lot were distributed in a petridish filled to 3/4 with moist soil. Three such replications were made for each treatment including control. At intervals of 5 and 14 days after sowing the unmber of seedlings in each dish were counted and the percentage of germination in each replication was calculated. After the second count 25 seedlings were collected from each dish along with their roots. They were washed and dried on a blotting paper under an electric fan. The height

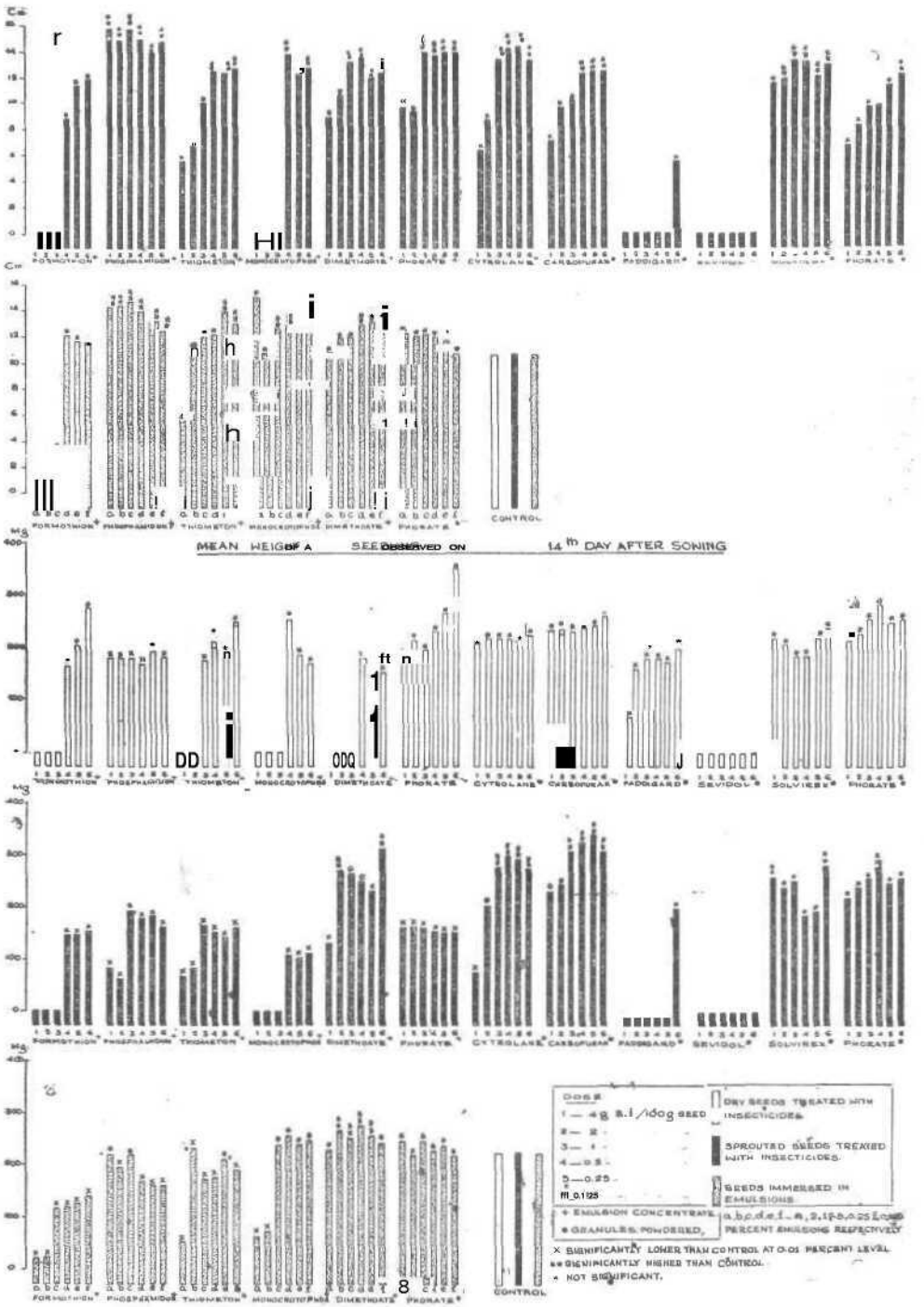
of the seedlings were taken with the aid of a graph paper. Their weight also was taken. From these the average weight and height of a seedling in each replication was calculated. In treatments where 25 seedlings were not present, the available ones were used for his purpose. A second experiment was carried out in the same method as above to study the effect of various insecticides on just sprouted seeds. In a third experiment sprouted seeds were soaked in 4, 2, 1, 0. 5, 0. 25 and 0.125 percent emulsions of formothion, phosphamidon. ekatin, monocrotophos, dimethoate and phorate for six hours. The soaked seeds were also dried under a fan and sown in dishes as described earlier. Seeds similarly soaked in water alone served as control.

Results and discussion

The data were subjected to statistical analysis and the results are presented in fig. 1. The germination observed on the fifth day is not included. The results show that dry seeds of paddy could be treated with solvirex up to the level of 4 g of a i. per 100g of seed, phorate (dust) and cytrolane up to 2g, phosphamidon up to 1g, monocrotophos, phorate (emulsion) and paddigard up to 0 25g, thiometon at 0.25g, and sevidol at 0.125g without significant deleterious effect on germination. However Mitra *et. al.* (1970) observed that phosphamidon and dimethoate were more toxic than carbofuran to paddy seeds. This may be due to the difference in the variety of paddy used by them. The height and weight of seedling in treatments with paddigard, sevidol and formotion were significantly lower than in control. Though the weight of the seedling in treatments with phosphamidon, phorate and dimethoate was low their mean height did not significantly differ from that of control. The variation in weight might be due to the difference in root growth. It is also seen from the figure that seeds treated with some insecticides showed significantly higher percentage of germination than control. The height and weight of the seedling also showed a similarphenomenon.

In controls, the germination of seeds ceased prior to the first observation on 5th day after sowing. But in some treatments like anthio, ekatin and dimethoate there was delayed germination and the number of seedlings increase1 significantly between fifth and fourteenth day after sowing. Though the percent germination of seeds treated with sevidol and paddigard was fairly high on the 5th dav after sowing (31 to 80 and 55 to 76 respectively) it declined significantly on the 14th day. In some treatments the seedlings became stunted and yellowish and in some they even dried up. These observations highlights the defect in the usual technique of assessing the effect of treatments when the seeds in control germinate fully. It will be desirable to assess results in such experiments 10 to 15 days after sowing.


MEAN PERCENT GERMINATION OF SEEDS OBSERVED ON 14 th DAY AFTER SOWING
(ANGLES RETRANSFORMED)
CONTROL
MEAN HEIGHT OF A SEEDLING OBSERVED ON 14 th DAY AFTER SOWING


MEAN WEIGHT OF A SEEDLING OBSERVED ON 14th DAY AFTER SOWING
DOSE
1 — 4 g a.i./100g SEED
2 — 2 -
3 — 1 -
4 — 0.5 -
5 — 0.25 -
6 — 0.125
DRY SEEDS TREATED WITH INSECTICIDES
SPROUTED SEEDS TREATED WITH INSECTICIDES
SEEDS IMMERSED IN EMULSIONS
+ EMULSION CONCENTRATE
* GRANULES, POWDERED
a,b,c,d,e,f = 4, 2, 1, 0.5, 0.25 PERCENT EMULSIONS RESPECTIVELY
X SIGNIFICANTLY LOWER THAN CONTROL AT 0.01 PERCENT LEVEL
** SIGNIFICANTLY HIGHER THAN CONTROL
- NOT SIGNIFICANT.
CONTROL

In the case of sprouted seeds the effect of treatment with solvirex and phorate dusts were the same as in the case of dry seeds. But carbofuran, phorate (E. C.) and dimethoate which could be used upto 0.25, 0 25 and 0.5 percent level alone on dry seeds, without adverse effect on germination, could be used was upto 2 percent level on sprouted seeds. But cytrolane which was not toxic to dry seeds upto 2 percent level tolerated only upto 0.5 percent level by sprouted seeds. The adverse effect of paddigard and sevidol was more drastic in the case of sprouted seed than in dry seeds. Thiometon was less toxic to sprouted seeds and formothion was equtoxic to dry and sprouted seeds. The figure also shows that the germination of low seeds soaked in all levels of insecticide emulsions was significantly low. It is observed that the direct mixing of insecticides with just sprouted seeds of paddy was comparatively less detrimental than mixing dry seeds with insecticides or immersing sprouted seeds in emulsions.

Summary

The effect of 12 insecticides, at six levels each, on the germination of paddy seeds (variety 'Thriveni') and the growth of emerging seedlings was assessed in the laboratory. Solvirex and phorate dusts were least toxic and they could be applied to dry and sprouted seeds upto 4 and 2 g of active ingredient respectively per hundred g of seeds withoat any deleterious effect. The highest safe doses of cytrolane, phosphamidon, monocrotophos phorate (E. C.), dimethoate, carbofuran, thiometon and formothion were 2, 1, 0.5, 0.5, 0,25, 0.25, 0.25 and 0.25 g respectively for 100 g of dry seeds 2, 0.5, 0.5, 0.5. 2, 2, 2, 0.5 and 0 25 respectively for 100 g of sprouted seeds. Sevidol and paddigard were unsuitable for seed treatment. When sprouted seeds were immersed in 4, 2, 1, 0.5, G 25 and 0.125 percent emulsions of formothion, ekatin, dimethoate, monocrotophos and phosphamidon for six hours the germination was significantly reduced in all treatments,

Acknowledgement

The authors are thankful to the Dean, Agricultural College, Vellayani for facilities provided.

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