# The Protection of Stored Potatoes Against the Potato Tuber Moth, *Gnorimoschema operculella* Zell.

PART 1—TRIALS IN SOUTHERN QUEENSLAND

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PART 2—TRIALS IN NORTHERN QUEENSLAND

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## SUMMARY

In a southern Queensland trial conducted in 1943-44 it was established that derris dust (1 per cent. rotenone) gave almost complete protection against tuber moth damage and was satisfactory for use on both seed and table potatoes. Ground magnesite was satisfactory for the treatment of seed potatoes. Pyridine (5 per cent. dust) was somewhat less effective, and " Hortosan D.P." (an organic mercurial fungicide) was useless for the purpose.

Northern Queensland trials in 1946 and 1947 showed derris dust (1 per cent. rotenone), magnesite and DDT (2 per cent. dust) to be effective in protecting stored potatoes, and ferric oxide to be relatively ineffective.

## PART 1—TRIALS IN SOUTHERN QUEENSLAND

### INTRODUCTION

Climatic conditions in southern Queensland favour the production of two potato crops each year, one in spring and the other in autumn. Seed for the spring planting is usually obtained from the southern States, while it is the normal practice for growers to hold portion of the spring crop as seed for the autumn planting. Large quantities of potatoes marketed from the spring crop may also be held in storage for retail disposal during the summer months.

Attacks by the potato tuber moth, *Gnorimoschema operculella* Zell., are common in the growing plants of the spring crop and almost invariably the tubers become infested either before or after harvesting. Subsequent summer conditions favour the rapid development of this pest and it is not unusual for partial or complete loss of the stored potatoes, whether for seed or table purposes, to occur if protective measures are neglected.

In an endeavour to determine a storage treatment suitable for general use, laboratory experiments with several insecticidal dusts were carried out early in 1943. Some of these gave promise of affording satisfactory protection of tubers and accordingly a field experiment was planned and conducted with Factor potatoes at Gatton following harvesting of the spring crop towards the end of 1943.

## MATERIALS AND METHODS OF TREATMENT

The materials used in the experiment were derris dust (1.0 per cent. rotenone), magnesite (90.0 per cent. passing through a 200-mesh B.P. sieve), pyridine dust (1 part of pyridine in 19 parts of kaolin), and " Hortosan D.P." The last-mentioned, an organic mercurial preparation, had no special claim for the protection of tubers against attacks by the larvae of the potato tuber moth ; but, because it was in use by some growers as a dip treatment for the prevention of potato scab, information on any action it might exercise against tuber moth attacks was desirable.

The treatments were applied to second and chat grade tubers, from which seed supplies are normally drawn. At the time of treatment (within 24 hours after digging), 4.8 per cent. of the second grade tubers and 4.4 per cent. of the chat grade tubers showed the entrance holes of larvae.

The layout of the experiment was of the 5 × 5 type, each set of replicates being placed in a separate room of a building in the field where the crop was grown.

All the dusts were applied in the same manner. Tubers with some dust were rotated in a kerosene tin and then run down a sloping sheet of galvanized iron covered with the dust, a complete coating of dust being ensured by hand-rolling the tubers as they gravitated together with surplus dust into the bag. By this method, the rate of application was roughly 1 lb. of dust per 3-bushel bag of potatoes. The " Hortosan D.P." application was made by the normal dipping method. Unit " plots " comprised slightly less than half a bag of tubers and all " plots " were set in position on November 24.

## RESULTS OF PRELIMINARY EXAMINATION

Top samples of 100 tubers, irrespective of grade, were taken from each bag on January 12 and examined for larval attacks. In addition, arbitrary ratings were assigned to the density of moths flying from each bag on opening. These ratings were as follows :—0, no moths ; 1, two or three moths ; 2, several moths ; 3, many moths ; and 4, almost a " cloud " of moths. The percentages of infested and sound tubers and moth density ratings are recorded in Table 1.

## DISCUSSION OF PRELIMINARY EXAMINATION

These results showed that during the seven weeks' storage all the treatments gave some protection against tuber moth as compared with the untreated samples, in which 82.0 per cent. of the tubers were attacked. Derris was outstandingly successful, with 92.8 per cent. of the tubers free from attacks. Magnesite, with 81.6 per cent. sound tubers, gave sufficient protection to be classed as a possible control ; it was closely followed by pyridine, with 80.0 per cent. sound tubers. " Hortosan D.P.", with half of the tubers damaged, could at this stage be considered a failure for tuber moth control.

The life cycle of the potato tuber moth in summer in southern Queensland is about six weeks and therefore this examination must have more or less coincided with the emergence of adults from the first generation. This is shown to be the case by the large number of moths which flew from the bags of untreated tubers.

**Table 1.**

PERCENTAGES OF INFESTED AND SOUND TUBERS AND MOTH DENSITIES AFTER 7 WEEKS' STORAGE.

| Treatment | — | Replicates | | | | | Mean |
|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | |
| Derris ... ... ... ... | Infested | 4 | 10 | 4 | 8 | 10 | 7.2 |
| | Sound | 96 | 90 | 96 | 92 | 90 | 92.8 |
| | Moth Density | 0 | 0 | 0 | 0 | 0 | |
| Magnesite ... ... ... | Infested | 22 | 34 | 12 | 20 | 4 | 18.4 |
| | Sound | 78 | 66 | 88 | 80 | 96 | 81.6 |
| | Moth Density | 1 | 2 | 0 | 1 | 0 | |
| Pyridine ... ... ... | Infested | 10 | 8 | 30 | 28 | 24 | 20.0 |
| | Sound | 90 | 92 | 70 | 72 | 76 | 80.0 |
| | Moth Density | 1 | 1 | 2 | 1 | 2 | |
| " Hortosan D.P." ... ... | Infested | 28 | 76 | 24 | 50 | 80 | 51.6 |
| | Sound | 72 | 24 | 76 | 50 | 20 | 48.4 |
| | Moth Density | 1 | 3 | 1 | 3 | 4 | |
| Untreated ... ... ... | Infested | 88 | 78 | 74 | 86 | 84 | 82.0 |
| | Sound | 12 | 22 | 26 | 14 | 16 | 18.0 |
| | Moth Density | 3 | 4 | 4 | 3 | 4 | |

In all samples there was a close relationship between estimated moth density and larval damage. No moths were seen to fly from any of the bags of the derris treatment, and only a few from those treated with magnesite and pyridine.

Internal damage in all treated tubers was slight, while in the untreated tubers it was mainly severe. The high level of infestation in the untreated bags must have resulted mainly from larvae present at the time of bagging, and would tend to show that the tubers must have been accompanied by a higher larval population than that indicated by the original infestation figures. In view of this fact, the beneficial effect of the derris treatment is all the more outstanding, and the negligible increase in damage indicates that derris kills larvae just within the tubers and prevents others from entering.

The increases in insect populations and tuber injury as shown at this examination must have been due essentially to infestation from external sources, either before or during storage, and in this respect the replicates of all treatments should have been equally placed. The figures representing sound tubers for the respective treatments may therefore be taken as a measure of the protection afforded against infestation from external sources, and before any possible build-up in populations could occur within the bags.

## RESULTS OF FINAL EXAMINATION

The final examination of the experimental material was made on February 25, six weeks after the preliminary examination and 13 weeks after the treatment. Fifty tubers of both second and chat grades were taken at random, separately, from the top half and the bottom half of the contents of each bag. After sprouting percentages had been assessed each tuber was assigned to one or other of four classes—namely, sound, light, moderate, and heavy—based on tuber moth injury. Of these four grades, the first two would have provided suitable planting material, while moderately and heavily damaged potatoes possessed no value for this purpose because practically all eyes were destroyed and destruction of internal tissue was considerable. The percentages of infested and sound tubers for both second and chat grades are recorded in Table 2.

**Table 2.**

PERCENTAGES OF INFESTED AND SOUND TUBERS AFTER 13 WEEKS' STORAGE.*

| Treatment | Replicate | Second Grade | | | | Chat Grade | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Sound | Infested | | | Sound | Infested | | |
| | | | Light | Moderate | Heavy | | Light | Moderate | Heavy |
| Derris ... ... | A | 96 | 4 | 0 | 0 | 94 | 5 | 1 | 0 |
| | B | 91 | 8 | 1 | 0 | 88 | 11 | 0 | 1 |
| | C | 93 | 4 | 3 | 0 | 84 | 13 | 3 | 0 |
| | D | 93 | 7 | 0 | 0 | 91 | 8 | 0 | 1 |
| | E | 94 | 6 | 0 | 0 | 91 | 4 | 5 | 0 |
| | Mean | 93.4 | 5.8 | 0.8 | 0 | 89.6 | 8.2 | 1.8 | .4 |
| Magnesite ... | A | 0 | 42 | 33 | 25 | 7 | 42 | 43 | 8 |
| | B | 24 | 52 | 7 | 17 | 29 | 39 | 24 | 8 |
| | C | 11 | 59 | 20 | 10 | 15 | 41 | 34 | 10 |
| | D | 42 | 46 | 4 | 8 | 47 | 32 | 14 | 7 |
| | E | 89 | 8 | 0 | 3 | 83 | 16 | 1 | 0 |
| | Mean | 33.2 | 41.4 | 12.8 | 12.6 | 36.2 | 34.0 | 23.2 | 6.6 |
| Pyridine ... ... | A | 11 | 64 | 12 | 13 | 13 | 49 | 36 | 2 |
| | B | 49 | 45 | 6 | 0 | 36 | 35 | 22 | 7 |
| | C | 9 | 32 | 20 | 39 | 21 | 33 | 27 | 19 |
| | D | 14 | 58 | 20 | 8 | 23 | 35 | 33 | 9 |
| | E | 6 | 56 | 20 | 18 | 17 | 36 | 24 | 23 |
| | Mean | 17.8 | 51.0 | 15.6 | 15.6 | 22.0 | 37.6 | 28.4 | 12.0 |
| "Hortosan D.P." | A | 32 | 64 | 4 | 0 | 19 | 41 | 31 | 9 |
| | B | 0 | 0 | 16 | 84 | 0 | 2 | 15 | 83 |
| | C | 1 | 16 | 36 | 47 | 1 | 8 | 42 | 49 |
| | D | 0 | 0 | 26 | 74 | 0 | 3 | 17 | 80 |
| | E | 0 | 8 | 48 | 44 | 0 | 8 | 16 | 76 |
| | Mean | 6.6 | 17.6 | 26.0 | 49.8 | 4.0 | 12.4 | 24.2 | 59.4 |
| Untreated ... | A | 2 | 18 | 29 | 51 | 0 | 18 | 36 | 46 |
| | B | 0 | 0 | 16 | 84 | 0 | 2 | 16 | 82 |
| | C | 0 | 5 | 23 | 72 | 0 | 6 | 16 | 78 |
| | D | 0 | 4 | 26 | 70 | 0 | 6 | 20 | 74 |
| | E | 0 | 6 | 9 | 85 | 0 | 2 | 8 | 90 |
| | Mean | 0.4 | 6.6 | 20.6 | 72.4 | 0 | 6.8 | 19.2 | 74.0 |

* "A" replicates of magnesite and "Hortosan D.P." treatments and untreated were somewhat affected by wetting while in storage.

A comparison of the figures representing the amount of infestation in tuber samples taken from top and bottom in each bag showed no consistent difference in the degree of infestation at different levels in the bags.

The escape of moths from the bags at the time of the preliminary examination would tend to reduce the amount of reinfestation within the bags, but it is assumed that the figures obtained at the final examination represent the aggregate effect of infestation from within and outside the bags. Moth populations inside the bags probably played the major part in increasing the percentages of damaged tubers during the last six weeks' period.

The results of the experiment are summarized in Table 3.

**Table 3.**

Summary of Results at the Final Examination.*

| —— | Treatment | Mean | 1% Level Significantly Exceeds | 5% Level Significantly Exceeds |
|---|---|---|---|---|
| 2nd grade ; percentage of sound tubers | 1. Derris | 93.4 | 2—5 | 2—5 |
| | 2. Magnesite | 33.2 | — | 4, 5 |
| | 3. Pyridine | 17.3 | — | — |
| | 4. " Hortosan " | 6.6 | — | — |
| | 5. Untreated | 0.4 | — | — |
| 2nd grade ; percentage of sound and lightly infested tubers | 1. Derris | 99.2 | 4, 5 | 3, 4, 5 |
| | 2. Magnesite | 74.6 | 4, 5 | — |
| | 3. Pyridine | 68.8 | 4, 5 | — |
| | 4. " Hortosan " | 24.2 | — | — |
| | 5. Untreated | 7.0 | — | — |
| 2nd and chat grades ; percentage of sound tubers | 1. Derris | 91.5 | 2—5 | 2—5 |
| | 2. Magnesite | 34.7 | 5 | 4, 5 |
| | 3. Pyridine | 19.9 | — | — |
| | 4. " Hortosan " | 5.3 | — | — |
| | 5. Untreated | .2 | — | — |

* See footnote to Table 2.

Second grade tubers normally represent the bulk of the autumn planting material ; but in seasons of light crops they, as well as first grade tubers, might be marketed for table purposes, and then the chat grade is largely drawn on for seed. The data obtained in this experiment for second grade tubers are therefore relevant to the storage of both table and seed potatoes.

## DISCUSSION OF FINAL RESULTS

The figures given in Tables 2 and 3 again emphasise the outstanding effectiveness of the derris treatment, 91.5 per cent. of the treated tubers being free from moth attacks. For sound second grade tubers, this treatment at the 1 per cent. level significantly exceeded all other treatments. For sound second and chat grade tubers combined, it was again significantly superior to all other treatments. Consequently it can be considered that derris is highly efficient for the treatment of tubers for both table and seed purposes. Magnesite, in this test, did not give enough protection to provide a reasonable percentage of sound tubers. Pyridine was almost valueless, and " Hortosan D.P." was useless. In the untreated bags there was scarcely a tuber that escaped attack.

Lightly infested tubers were considered suitable for seed purposes. Combining the percentages of sound and lightly infested tubers for both second and chat grades, the derris treatment with 98.5 per cent. gave sufficiently complete protection for practical purposes. Magnesite gave 72.4 per cent. usable tubers, and pyridine 64.2 per cent.; both of these materials could be used for the treatment of seed potatoes, though picking over would be desirable before planting.

During the experiment a window of the room housing replicate A became faulty and allowed rain to fall on the untreated, magnesite and " Hortosan D.P." treated bags. It would appear that this external factor reduced the efficiency of the magnesite treatment and reduced the severity of attacks in the untreated and " Hortosan D.P." treated tubers in this replicate.

**Table 4.**

MOTH DENSITIES AND PERCENTAGES OF SPROUTED TUBERS AFTER 13 WEEKS' STORAGE.

| Treatment | Replicate | Moth Density | Percentage of Sprouted Tubers | |
|---|---|---|---|---|
| | | | 2nd Grade | Chat Grade |
| Derris ... ... ... ... | A | 0 | 80 | 48 |
| | B | 0 | 63 | 50 |
| | C | 1 | 65 | 57 |
| | D | 0 | 66 | 45 |
| | E | 0 | 67 | 52 |
| | Mean | — | 68.2 | 50.4 |
| Magnesite ... ... ... ... | A | 4 | 41 | 30 |
| | B | 2 | 46 | 28 |
| | C | 3 | 36 | 25 |
| | D | 2 | 71 | 51 |
| | E | 0 | 62 | 48 |
| | Mean | — | 51.2 | 36.4 |
| Pyridine ... ... ... ... | A | 4 | 48 | 38 |
| | B | 1 | 72 | 41 |
| | C | 3 | 25 | 38 |
| | D | 3 | 36 | 20 |
| | E | 3 | 20 | 16 |
| | Mean | — | 40.2 | 30.6 |
| " Hortosan D.P." ... ... | A | 3 | 77 | 47 |
| | B | 3 | 11 | 3 |
| | C | 3 | 8 | 0 |
| | D | 3 | 5 | 1 |
| | E | 3 | 11 | 5 |
| | Mean | — | 22.4 | 11.2 |
| Untreated ... ... ... ... | A | 3 | 35 | 28 |
| | B | 4 | 8 | 5 |
| | C | 3 | 2 | 0 |
| | D | 4 | 5 | 2 |
| | E | 3 | 4 | 1 |
| | Mean | — | 8.8 | 7.2 |

Moth populations emerging from the bags, when opened, were again recorded at the final examinations, which more or less coincided with the completion of the second generation, though many living pupae were still present. The moths were particularly abundant in the bags of untreated tubers, and also abundant in the bags of "Hortosan D.P.", pyridine and magnesite treatments, decreasing slightly in that order. In only one bag of the derris treated tubers were there any signs of moths, and then of only one or two individuals. It was evident, therefore, that only the derris treatment was effective in preventing the population build-up of the second generation in the tubers. Moth densities are shown in Table 4.

The amount of protection given by each treatment is reflected to some degree in the percentages of tubers showing sprouts (Table 4), though it is to be remembered that all seed potatoes might not sprout before being planted. In this case, however, if the relationship between the percentage of sprouted tubers and the percentage of clean and lightly infested tubers for each treatment were plotted it would be represented by almost a straight line. This may be taken largely to confirm the statement previously made that lightly infested tubers may still be suitable as planting material.

Sprouts appeared on 8.0 per cent. of the untreated tubers. They were apparently normal in colour and shape and few exceeded half-an-inch in length. Those on tubers treated with "Hortosan D.P.", represented by 16.8 per cent., were comparable to those on untreated tubers. A marked difference was shown by the sprouts on the derris treated tubers. They occurred on 59.3 per cent. of the tubers, and while their colour was similar to that of sprouts on untreated tubers, their length averaged about an inch and they were strikingly more robust. Sprouts occurred on 43.8 per cent. of tubers treated with magnesite and 35.4 per cent. of those treated with pyridine. In these two treatments they were similar to each other, but differed from each of the other treatments in that they were pale, greatly lengthened and spindly.

Attacks by tuber moth larvae had spread from the tubers to the sprouts in all treatments or had occurred directly on the sprouts. These sprout infestations were severe on untreated and "Hortosan D.P." treated tubers, moderately heavy in the cases of pyridine and magnesite, and rather less serious in the sprouts of the derris treated tubers. Because of their more robust growth, however, the sprouts on the derris treated tubers were least affected by the attacks, and if these tubers had been planted most of the sprouts would have developed into normal plants.

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## PART 2—TRIALS IN NORTHERN QUEENSLAND

In 1945, an experimental lot of 20 tons of potatoes produced in the Home Hill-Ayr district was dusted with magnesite at the time of harvesting and stored for about three months without excessive loss. This prompted controlled storage trials in 1946 and 1947 to compare the efficiency of several insecticidal dusts in the protection of stored tubers against tuber moth attack.

In the 1946 trial, three dusts were used—namely, derris (1.0 per cent. rotenone content), magnesite and ferric oxide, the last being a mineral dust placed on the market in 1946 for the specific purpose of treating potatoes. The ferric oxide was inferior to the other dusts, and in 1947 a 2.0 per cent. DDT-pyrophyllite dust was substituted for it, the other two dusts being retained.

### EXPERIMENTAL METHODS

Tubers after harvest were emptied on to a clean floor in 3-bushel bag lots, counted, dusted and transferred back to the bags for storage. The selected quantity of dust for one bag (1 lb. in the 1946 trial, reduced to ½ lb. in the 1947 trial) was weighed out and about one-tenth of this placed in the bottom of a kerosene tin, which was then filled with potatoes and a similar quantity of dust sprinkled over the top. The tin was then inverted and the contents poured into a bag, and the operation repeated until the bag was filled, about five tinsful being required. Tubers treated in this manner were more or less uniformly covered by a fine film of the dust. After treatment the bags were sewn and placed singly on end for storage.

After the expiration of several weeks each bag was emptied on to a clean floor and the contents picked over. This operation was repeated at intervals of about two weeks until the termination of the trials. At each sampling decayed and decaying tubers were discarded so as to avoid contaminating the contents of the bags, and a record was kept of the numbers of moth-infested and otherwise damaged tubers. From these data progressive totals, expressed as percentages of the original numbers, were calculated.

### 1946 TRIAL

The potatoes used in the 1946 trial comprised eight bags of the Brownell variety harvested on October 10 and passed as free of tuber moth and mechanical injury. On November 1 the tubers were re-bagged after dusting at the rate of one pound per bag, with two bags allotted to each of the following treatments :—Derris (1.0 per cent. rotenone), magnesite, ferric oxide, and untreated.

The first sampling was carried out on December 6, about 5 weeks after dusting, with subsequent samplings 7, 9, 12 and 14 weeks after treatment. After 12 weeks, tuber moth losses in the untreated bags exceeded 50 per cent., and there was a loss of over 20 per cent. from unspecified rots. Table 1 sets out the losses of stored tubers at the expiration of the periods shown.

Derris and magnesite gave a high degree of protection, with ferric oxide inferior, but nevertheless highly effective in comparison with the untreated. There was a regular increase in losses in the checks, the graph being almost a straight line, with losses proportional to the length of the storage period. In treated lots there

**Table 1.**

PROGRESSIVE TUBER MOTH LOSSES OVER STORAGE PERIOD OF 14 WEEKS (EXPRESSED AS PERCENTAGES OF ORIGINAL NUMBER OF TUBERS STORED).

| Treatment | After 5 weeks | After 7 weeks | After 9 weeks | After 12 weeks | After 14 weeks |
|---|---|---|---|---|---|
| Derris ... ... ... ... | 0.35 | 0.35 | 0.55 | 0.55 | 0.55 |
| Magnesite ... ... ... ... | 0.85 | 0.85 | 1.95 | 2.40 | 2.40 |
| Ferric Oxide ... ... ... | 5.45 | 5.45 | 6.35 | 6.75 | 6.75 |
| Untreated ... ... ... ... | 22.40 | 27.40 | 39.66 | 52.15 | — |

was no observed increase in moth damage from the fifth to the seventh week, but a slight increase then took place, as recorded at the end of the ninth week. Application of known data regarding the life history of the tuber moth makes it clear that there must have been two generations during the period of the trial and the activity of this second generation would account for the rise in damage mentioned above.

Assuming that all dusts were to a greater or lesser extent lethal to exposed larvae, most of the survivors would have been those which had penetrated the tissues before the dusts were applied. In the case of the untreated potatoes this factor would be inoperative and would permit an overlapping of generations, as indicated by the uniform increase in observed losses. While ferric oxide was inferior to the other two dusts in controlling the first generation, the position was somewhat different with the second. Considering only additional losses after the seventh week, presumably due to the activities of a second generation, ferric oxide was slightly superior to magnesite, though both were still inferior to derris.

With the first generation there was the distinct probability that some larvae had penetrated tubers before the dusts were applied. As suggested by Brimblecombe in Part 1 of this paper, derris may be lethal to larvae so protected, provided they have not penetrated deeply into the tissues. This may explain the marked superiority of derris over ferric oxide at the first sampling. If that is so, then it would also appear that magnesite acted in much the same manner, whereas ferric oxide did not. This condition could not have applied to the second generation, since eggs must have been laid, and larvae emerged, exposed to the action of the dusts. Here ferric oxide and magnesite have given much the same results, and this tends to support the view expressed above. In both cases derris was superior to the other dusts, which may be explained by its different mode of action.

## 1947 TRIAL

For this trial it was considered preferable to more nearly simulate commercial conditions by subjecting the potatoes used to nothing more than the usual field grading. Eight bags of Factor potatoes were treated on September 23, and the trial was comprised of four treatments of two bags each, as follows :—Derris (1.0 per cent. rotenone), DDT-pyrophyllite (2.0 per cent. p-p isomer), magnesite, and untreated.

The first sampling was carried out on October 15, three weeks after dusting, with subsequent samplings 7, 9, 11, 15 and 21 weeks after the commencement.

Losses due to unspecified rots were less than 12 per cent. and tuber moth losses did not exceed 3.5 per cent. in checks, hence it was possible to prolong the storage period to 21 weeks. Table 2 sets out tuber moth losses during the course of the trial.

**Table 2.**

PROGRESSIVE TUBER MOTH LOSSES OVER STORAGE PERIOD OF 21 WEEKS (EXPRESSED AS PERCENTAGES OF ORIGINAL NUMBERS OF TUBERS STORED).

| Treatment | After 3 weeks | After 7 weeks | After 9 weeks | After 11 weeks | After 15 weeks | After 21 weeks |
|---|---|---|---|---|---|---|
| Derris ... ... ... | 1.28 | 1.58 | 1.78 | 1.88 | 2.07 | 2.07 |
| DDT ... ... ... | 0.76 | 0.96 | 1.24 | 1.52 | 1.63 | 1.63 |
| Magnesite ... ... | 0.60 | 1.20 | 1.20 | 1.30 | 1.30 | 1.30 |
| Untreated ... ... | 2.72 | 3.11 | 3.21 | 3.40 | 3.50 | 3.50 |

One striking feature of this trial is the fact that moth losses did not increase beyond the 15-week limit, and it is inferred that the regular discarding of affected tubers, quite apart from the effect of dusting, completely eliminated the source of infestation after 15 weeks. All three dusts kept losses below 2 per cent. over the whole period of the trial, and individual differences were so small as to be insignificant.

## DISCUSSION OF RESULTS

It is clear that losses may be kept at a low level by the use of either 2.0 per cent. DDT or derris (1.0 per cent. rotenone) dusts applied at the rate of ½ lb. per bag, or 8 lb. per ton, at or immediately after harvesting. It is taken for granted that care would be exercised to ensure that only sound tubers are stored, otherwise losses from rots might become a limiting factor. Since it has been reported by Jenkins and Forte (1946) that DDT residues remaining after cooking are extremely small, this insecticide may be used for the protection of table potatoes as well as seed.

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