Fungicidal Control of Late Blight of Potatoes at Rahangala

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THE potato crop is liable to a considerable number of diseases caused by fungi, bacteria and viruses and the successful cultivation of this crop depends on the occurrence of these in the locality and the extent to which control measures for these diseases are economically practicable in the area. Of these diseases, late blight caused by the fungus *Phytophthora infestans* (Mont de Bary) is perhaps most commonly associated with this crop wherever it is grown. Fungicidal control of late blight has been the subject of study by numerous workers and in a great majority of cases the efficacy of spray treatments has been vindicated so that they have become a routine practice in the cultivation of this crop. The destructiveness of this disease varies from season to season and serious losses are still reported especially exacted from the unwary farmer who has neglected to spray his crop. Climate and rainfall are important factors in determining the extent of control obtained by spray treatments.

The first record of the cultivation of potatoes in Ceylon dates back to 1812 when Mr. J. F. Lorenz was stated to have successfully grown this crop on a small scale in Morawak Korale. (1). The local potato or Nuwara Eliya potato *Solanum commersonii* which originated in Uruguay was introduced to Hakgala Gardens in 1909 according to Macmillan (2) and 'yielded fair sized tubers closely resembling the common potato both in appearance and eating quality but the yield is poor as compared with the latter'. The statement that *Solanum commersonii* was found at the time to be resistant to disease has been borne out by the fact that it is still found in cultivation in the Nuwara Eliya district without even the elementary precautions of disease control under which conditions the other varieties have been badly affected.

Various attempts at growing potatoes were made recently at the higher elevations of the island at Bopatalawa, Ambewela and Mahagastota where late blight was observed to be one of the most important factors in reducing yields owing to the rather high precipitation and mist obtaining in these areas. With the beginning of the cultivation of this crop at Rahangala and its surroundings it was thought more feasible to explore the possibilities of the fungicidal control of late blight owing to the drier climate here when compared with the earlier mentioned places. Moreover, the assessment of the effects due to other diseases could not be made until the overall effects of late blight were eliminated or reduced. The following experiment was therefore designed to find out whether late blight could be economically controlled under the conditions at Rahangala and to what extent it decreased the yield and brought about a reduction in tuber size.

Experimentation

The experiment was laid out at Rahangala Experiment Station. The layout took the form of five randomized blocks each of seven plots. Each plot which was 1/272 of an acre in size consisted of twelve rows of plants with eight plants per row making a total of 96 plants per plot. Records were taken from a central area carrying 60 plants (10 rows of 6 plants) leaving a row all round to overcome border effects. As the crop was grown under irrigation, bunds were so arranged as to enable irrigation of each plot separately to eliminate the possibility of water from one plot passing on to another.

The experimental plots were manured uniformly with cattle manure at the rate of 5 cwt. per acre and with a dressing of artificial fertilizers at 7 cwt. per acre, consisting of 3 cwt. of sulphate of ammonia, 2 cwt. of sulphate of potash and 2 cwt. of superphosphate (conc.). Planting was of the ridge and furrow system with 1 foot wide ridges alternating with 1 foot wide furrows. The cattle manure and the artificials were placed in the furrow and mixed well with the soil. Seed consisted of certified tubers of the variety Great Scott, tubers being so selected that each approximately weighed 1 1/3 oz. Tubers were planted in the furrow at a spacing of 10 inches between plants and 2 feet between rows and covered over with 2-3 inches of soil.

Fungicidal Treatments

Three fungicidal sprays were used :

(*a*) A proprietary cuprous oxide spray containing 50 per cent. of copper (Perenox) at the rate of 4 oz. in 10 gallons.

(*b*) A proprietary copper oxychloride spray containing 50 per cent. copper (Cupravit) at the rate of 4 oz. in 10 gallons.

(c) Bordeaux mixture—prepared according to the 4-4-40 formula.

To each spray mixture was added an emulsified white oil Albolineum. 2 at the rate of 1.6 oz. in 10 gallons as a spreader.

These three fungicides were used at two intervals of application, weekly and fortnightly and each block had an unsprayed control. The above treatments were randomized in each of the five blocks.

Spraying Technique

spraying was carried out with Knapsack sprayers. The spray lance was fitted with an angle bend to facilitate the spraying of the lower surfaces of the leaves thoroughly and the single nozzle delivered a fine mist of spray. The amount of fungicide necessary to spray each plot naturally increased with the increase in size of the plants. No attempt was made to economize on the spray but rather the object was to ensure the complete coverage of the plant. When the plants were fully grown approximately one gallon of spray was necessary for each plot of 96 plants (1/272 acre). As different fungicides were to be used on different plots in the same block, jute hessian screens were held round the plot sprayed to prevent spray drift from it to the neighbouring ones.

Maha Season, 1952, January-April

For this season the experiment was planted out on January 24, 1952. A

rather heavy shower (1.82 in.) followed on the evening of this day and it is possible that some of the effects of the artificials may have been lost. However, this effect would have been felt all over the experimental area. Sprouting occurred fairly uniformly although a few tubers were a little belated in their germination. A few vacancies due to seed piece decay were noticed. The number of vacancies was, however, small and scattered all over the plots so that they could not be considered to have materially altered the subsequent yield and other data.

The first spraying was carried out on February 27, 1952, when the plants were 10 inches in height, approximately one month from the date of planting. At this time there was no evidence of early or late blight on any of the plants in the plots. Thereafter the respective plots were sprayed weekly or fortnightly as the case may be until nine weekly sprayings had been given. Spraying operations were generally carried out early in the morning or late in the evening in order to avoid scorching of leaves. It is worthy of note that no spray scorch was observed in any of the plots.

It was observed that the Bordeaux mixture imparted a deeper bluish green colour to the plants. Cupravit caused a slight intensification of the natural green while the Perenox-sprayed plants were greenish brown owing to the colour of this fungicide. Bordeaux-sprayed plants were healthier and slightly larger than those sprayed with the proprietary fungicides.

Rainfall. A glance at the monthly rainfall chart Fig. I shows that the precipitation for the period of growth of this crop was much higher than the average for the same period at Rahangala for the last seven years. For April 1952, rainfall was more than double the average and as this period coincided with the latter part of the growth period of the crop, when it is most susceptible to late blight, it is evident that the treatments have had a very rigorous trial as regards the assessment of their efficacy in controlling the disease.

Results. Early blight began making its appearance in the fifth week after planting. The infection was light and not confined to any particular treatment or control. Table I shows the number of plants showing infection due to early blight on March 19, 1952. Any plant showing even one leaf spot was considered infected.

Table I—Average number of plants infected with Early and Late Blight on March 19, 1952

Treatments	*Perenox*		*Cupravit*		*Bordeaux mixture*		*Unsprayed*
Weekly or fortnightly	W.	F.	W.	F.	W.	F.	
Early blight	5·2	4·4	6·8	6·6	5·6	5·0	5·8
Late blight	0	0	0	0	0	0	3·8

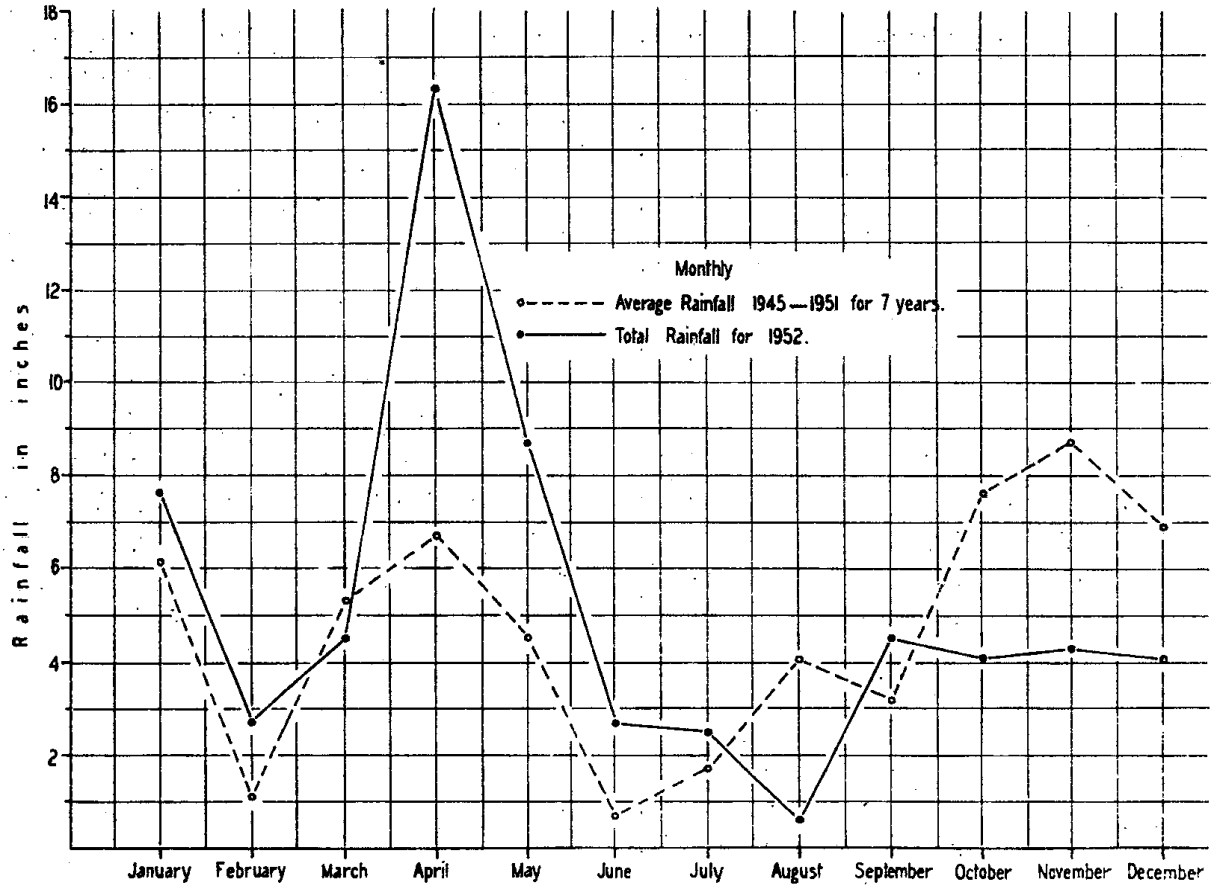

FIG. I—Rainfall Graph.

No appreciable control of early blight appears to have been produced. It is, however, presumable that this light infection represents the development of latent infection which occurred before spraying began. At this stage, however, late blight was also making its appearance but was confined to the controls, while all sprayed plots were free. Late blight rapidly gained ground subsequently but the greater infection was in the unsprayed controls. Table II shows the position of the plots as regards late blight infection on March 27, 1952.

Table II—Average number of plants infected with Late Blight on March 27, 1952

Treatments	*Perenox*		*Cupravit*		*Bordeaux mixture*		*Unsprayed control*
Weekly or fortnightly	W.	F.	W.	F.	W.	F.	
Late blight	12·6	9·4	11·4	6·2	8·6	3·0	46·8

FIG. II—*Left:* Plot sprayed weekly with Bordeaux mixture (4-4-40). *Middle:* Plot sprayed fortnightly with Bordeaux mixture (4-4-40). *Right:* Control plot—unsprayed.

By 23rd April, the last date of spraying, nine weekly and five fortnightly sprayings had been carried cut. Almost daily rain was experienced during April and the disease spread very rapidly killing off all the plants in the unsprayed controls so that these plots were bare of plants. The sprayed plants were only lightly attacked, the fortnightly sprayed ones, however, showed more infection than the weekly sprayed ones. Fig. II shows the position at this time, of plots sprayed weekly and fortnightly with Bordeaux mixture and an unsprayed control.

The plots were harvested on May 19, 1954, excluding the border rows and the yield recorded. Any badly rotting tubers which could hardly be weighed were discarded. After this the harvest of each plot was separated into 3 grades as follows :—

Grade I—Tubers not passing through mesh of $1\frac{1}{2}$ in. square.

Grade II—Tubers passing through a mesh of $1\frac{1}{2}$ in. square but not through one of 1 in. square.

Grade III—Tubers passing through a mesh of 1 in. square.

Table III shows the yield of the plots of the various treatments and the histogam, Fig. III, the average weights of Grade I, II and III potatoes for each treatment.

From the analysis of variance ; Table IIIA, of the yields for the various treatments the following conclusions may be drawn :—

1. All treatments are superior to the unsprayed control at a high level of significance 0.001. The yield increases for the various treatments are from 52.16 per cent. to 84.11 per cent. over the unsprayed control.

Table III—Yield per Plot in Ounces (Maha 1952)

Blocks	*Perenox*		*Cupravit*		*Bordeaux Mixture*		*Control*	
	Weekly	*Fortnightly*	*Weekly*	*Fortnightly*	*Weekly*	*Fortnightly*		
I	805	800	849	715	827	920	510	
II	894	693	908	600	857	537	464	
III	713	725	835	812	809	791	428	
IV	791	753	844	779	892	736	456	
V	758	506	771	769	774	887	427	*Sig. Diff.* 0·001
Total	3961	3477	4207	3675	4159	3781	2285	
Mean	792·2	695·4	841·4	735·0	831·8	774·2	457·0	207·17

	Perenox	*Cupravit*	*Bordeaux Mixture*	*Sig. Diff. : 0·05*
Mean	743·8	788·2	803·0	80·7

	Weekly	*Fortnightly*	*Sig. Diff. : 0·05*	*Sig. Diff. : 0·01*
Mean	822	735	65·9	89·33

All treatments are significantly better than the control at 0·001 level.
No significant difference between Perenox, Cupravit and Bordeaux mixture.
Weekly spraying better than fortnightly spraying at 0·05 level.

Table IIIA—Analysis of Variance

	Degrees of Freedom	*Sums of Squares*	*Mean Square*	*Variance Ratio*	*F. Value for Significance* 5%	1%	0·1%
Treatments	6	521528	86921	11·36‡	2·51	3·67	5·55
Blocks	4	27211	6803	0·89	2·78	4·22	6·59
Error	24	183646	7652				
Total	34	732385					

‡ Significant at 0·1 per cent.

An increase in yield of this order only serves to emphasize the heavy toll taken by blight from previous potato cultivations where, in the main, no spraying or inadequate spraying has been carried out.

2. Weekly sprayings were significantly better than fortnightly sprayings at 0.05 level.
3. There was no significant difference between the three fungicides used Perenox, Cupravit and Bordeaux mixture.

Yala Season, 1952, July-November

Under the conditions obtaining at Rahangala and its environs two crops of potatoes could be raised during the year. The seasons are chosen to enable the crop to mature in dry weather. The experiment was repeated again in *yala* using for seed, potatoes harvested from the general multiplication area grown in the *maha* season and employing another block of land for the purpose. The same lay out, method of planting and manuring were employed and planting was done on July 9, 1952. The first spraying was on August 30, 1952, and thereafter weekly and fortnightly sprayings were carried out until a total of 10 weekly sprayings were applied. The tubers were harvested on November 6, 1952.

Rainfall. The rainfall curve for the period of growth of this crop, Fig. I, shows that just as much as the precipitation was higher than the average of 7 years for the *maha* season it was generally lower than the average for *yala*. The first incidence of late blight was noticed later in the growth of this crop, i.e., at 10 weeks and the spread was not as rapid.

The rainfall that did obtain, however, was sufficient for the slow spread of the infection so that three months after planting the unsprayed control plots were almost all defoliated. Table IV shows the weights of harvested tubers per plot and Table IVA the analysis of variance.

Results. The results for second season (*yala*) amply confirms in every way those obtained for the first season (*maha*).

1. All treatments are significantly better than the control at 0.001 level.
2. There is no significant difference between Perenox, Cupravit and Bordeaux mixture.
3. Weekly sprays are significantly better than fortnightly sprayings at 0.05 level.

The plot yields for this experiment were graded into Grade I, II and III as for *maha* and the weights of the three grades of potatoes were further subject to an analyses of variance. Tables V, VI and VII give the weights of these three grades for the various plots and Tables VA, VIA and VIIA sets out the analyses for variance. The results for *maha* are on a parallel to *yala* figures and were not statistically analysed to prevent duplication (Fig. III).

Efficacy of Treatments in Relation to Tuber Size

A comparison of the yields of Grade I, II and III enables the following conclusions to be drawn. All spray treatments

Table IV—Yield per Plot in Ounces (Yala 1952)

Blocks	*Perenox*		*Cupravit*		*Bordeaux Mixture*		*Control*	
	Weekly	*Fortnightly*	*Weekly*	*Fortnightly*	*Weekly*	*Fortnightly*		
I	824	704	768	816	840	916	480	
II	904	616	872	896	908	584	436	
III	776	704	696	664	772	752	432	
V	904	736	664	848	816	852	552	*Sig. diff.* : 0·001
Total	4272	3416	3756	3936	4104	3712	2348	
Mean	854·4	683·2	751·2	787·2	820·8	742·4	469·8	210·06

	Perenox	*Cupravit*	*Bordeaux Mixture*	*Sig. diff. : 0·05*
Mean	768·8	769·2	781·6	81·85

	Weekly	*Fortnightly*	*Sig. diff. : 0·05*	*Sig. diff. : 0·01*
Mean	808·8	737·6	66·85	90·59

All treatments are significantly better than the control at 0·001 level.

No significant difference between Perenox, Cupravit and Bordeaux mixture.

Weekly spraying better than fortnightly spraying at 0·05 level.

Table IVA—Analysis of Variance

	Degrees of Freedom	*Sums of Squares*	*Mean Square*	*Variance Ratio*	*F Value for Significance*		
					5%	*1%*	*0·1%*
Treatments	6	487966	81327	10·34‡	2·51	3·67	5·55
Blocks	4	3416	854	·11	2·78	4·22	6·59
Error	24	188789	7866				
Total	34	680171					

‡ Significant at 0·1 per cent.

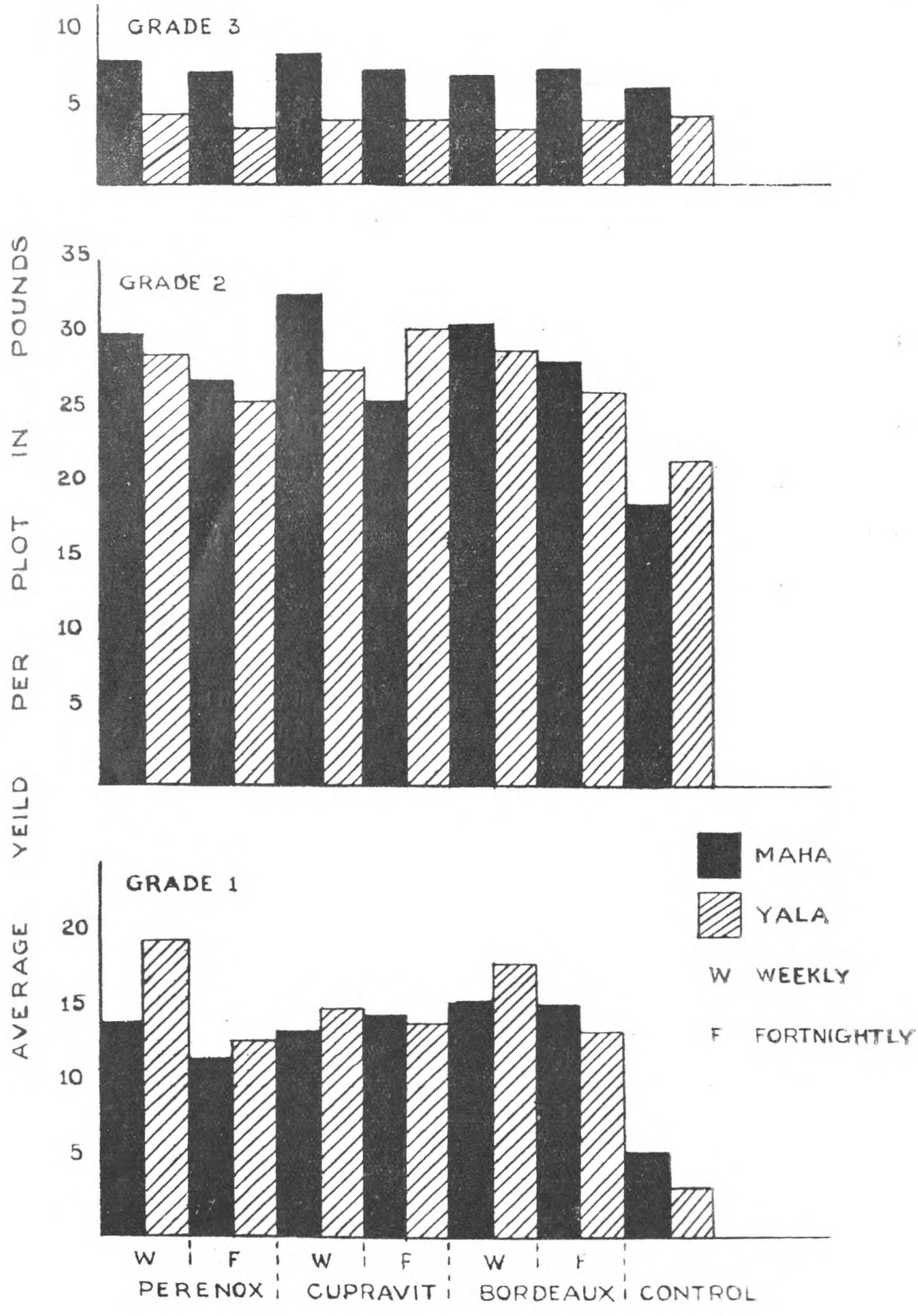

FIG. III—Fungicidal control of Late Blight of potatoes

Table V—Yields of Potatoes of Grade I per Plot in Ounces (Yala 1952)

Blocks	*Perenox*		*Cupravit*		*Bordeaux Mixture*		*Control*	
	Weekly	*Fortnightly*	*Weekly*	*Fortnightly*	*Weekly*	*Fortnightly*		
I	232	256	240	264	288	240	40	
II	360	160	328	240	240	136	56	
III	256	232	200	188	276	224	48	
IV	328	168	272	160	288	192	40	
V	392	232	176	296	376	312	72	
								Sig. diff. :
Total	1568	1048	1216	1148	1468	1104	256	0·001
Mean	313·6	209·6	243·2	229·6	293·6	220·8	51·2	121·15

	Perenox	*Cupravit*	*Bordeaux*	*Sig. diff. : 0·05*
Mean	261·6	236·4	257·2	47·22

	Weekly	*Fortnightly*	*Sig. diff. : 0·05*	*Sig. diff. : 0·01*	*Sig. diff. : 0·001*
Mean	283·5	220·0	38·56	52·25	69·69

All treatments are significantly better than the control at 0·001 level.

No significant difference between Perenox, Cupravit and Bordeaux mixture.

Weekly sprayings better than fortnightly sprayings at 0·01 level.

Table VA—Analysis of Variance

	Degrees of Freedom	*Sums of Squares*	*Mean Square*	*Variance Ratio*	*F Value for Significance*		
					5%	*1%*	*0·1%*
Treatments	6	216720	36120	13·80‡	2·51	3·67	5·55
Blocks	4	17178	4295	1·64	2·78	4·22	6·59
Error	24	62809	2617				
Total	34	296707					

‡ Significant at 0·1 per cent.

show a definitely significant difference at 0·001 level over the unsprayed controls in relation to the Grade I tubers produced. In the production of Grade II tubers too there is a superiority of all spray treatments except Perenox fortnightly, but the level of significance is lower at 0·05. On the other hand the quantity of Grade III or "chat" size potatoes is the same in the sprayed plots and the control, there being no significant difference between them. There is no doubt, therefore, that the most important effect of the spray treatments is the increase in production of the large Grade I potatoes and to a lesser extent in the Grade II potatoes. The histogam (Fig. III) sets this out even more clearly.

Efficacy of Intervals of Spraying in relation to Tuber Size

Weekly spraying shows a definite significant difference over the fortnightly spraying at 0·01 level in the production of Grade I tubers. Apart from this however there has been no difference between the weekly sprayed and fortnightly sprayed plots in the amount of Grade II tubers produced. The same holds for the Grade III size as well. Therefore, under the conditions of the experiment not only are weekly sprays necessary to obtain the highest yield, it is also an important factor in the production of good sized tubers.

Cost of Spraying

The experiment was not designed to explore the economics of spraying and as has been already stated the object was to find out the extent of control possible of the disease. Rather more fungicide than necessary was used but it is possible to get a rough estimate of costs of spraying per acre from the plots as follows. Yields are based on the effective experimental area of 1/435 acre plots which exclude irrigation bunds.

Costs of Spraying at 300 Gallons per Aere

	Rs.	*c.*
Fungicide (Cupravit) 7½ lb. at Rs. 2·50 per lb.	18	75
Spreader, Albolineum 2, 3 lb. at Re. 1·12 per lb.	3	36
Labourer 4 units at Rs. 2·50	10	0
Depreciation of sprayers	2	50
Cost of spraying per acre	34	61

	Rs.	*c.*
For 10 sprayings = 34·61 × 10	346	10

	Lb.
Average yield of weekly sprayed plot	51·36
Yield per acre	22,341·60
Average yield of unsprayed plot	28·56
Yield per acre	12,423
Increased yield due to spraying	9,918

	Rs.	*c.*
Cost of increased yields per acre at 30 cents per lb.	2,689	65

Table VI—Yields of Potatoes of Grade II per Plot in Ounces (Yala, 1952)

Blocks	*Perenox*		*Cupravit*		*Bordeaux*		*Control*
	Weekly	*Fortnightly*	*Weekly*	*Fortnightly*	*Weekly*	*Fortnightly*	
I	472	368	432	456	480	444	352
II	480	392	488	584	592	372	324
III	448	416	432	424	456	448	328
IV	464	428	424	496	416	352	320
V	448	448	432	480	376	484	416
Total	2312	2052	2208	2440	2320	2100	1740
Mean	462·4	410·4	441·6	488·0	464·0	420·0	348·0

Sig. diff.: ·001 = 116·28 ; *Sig. diff.:* ·01 = 86·85 ; *Sig. diff.:* ·05 = 64·09

	Perenox	*Cupravit*	*Bordeaux Mixture*	*Sig. diff.:* 0·05
Mean	436·4	464·8	442·0	45·41

Weekly	*Fortnightly*	*Sig. diff.:* ·05
456·0	439·5	37·0

All treatments except Perenox fortnightly are significantly better than the control at 0·05 level.
No significant difference between Perenox, Cupravit and Bordeaux Mixture.
No significant difference between weekly and fortnightly.

Table VIA—Analysis of Variance

	Degrees of Freedom	*Sums of Squares*	*Mean Square*	*Variance Ratio*	*F Value for Significance* 5%	1%	0·1%
Treatments	6	64137	10690	4·00†	2·51	3·67	5·55
Blocks	4	9612	2403	·997	2·78	4·22	6·59
Error	24	57838	2410				
Total	34	131587					

† Significant at 1 per cent.

Although the calculations are based on averages of small plots the margin of profit is too large to leave any doubts regarding the efficacy of spraying and its returns. On the other hand actual spraying on an acre basis is bound to be very much less than the calculated costs of experimental spraying. There is no doubt that the costs of spraying could be still further reduced when the minimum number of sprays per season, concentration of spray fluid, and the spray volume per acre are further explored.

Discussion

The results of the experiments for the two seasons *maha* and *yala* show that spraying has been of great significance in increasing the yields of potato by controlling the damage caused by late blight. During the *maha* season much more than average precipitation was obtained and the reverse was the case for *yala*. In both seasons, however, the climatic conditions were obviously favourable to set up severe infection by late blight and in spite of the lower rainfall obtaining in *yala* it must be considered that the precipitation was sufficient to promote infection. According to Beaumont (3) the conditions favouring an epidemic of late blight are a minimum temperature of 50° F and a relative humidity not falling below 75 per cent. for at least two days. The actual temperatures obtaining at Rahangala are not available but temperatures recorded at the nearest meteorological station (Diyatalawa) give a maximum of 78.9° F and a minimum of 58.1° F for the whole year. It, therefore, appears that the predisposing factors of temperature and rainfall are present during both seasons for the onset of late blight at Rahangala and the crop requires protection during both seasons.

The spray treatments sufficiently controlled the disease during the abnormally wet *maha* with 16 inches of rain during April, the most vulnerable period of the growth of the crop, giving 80 per cent. higher yield over the untreated controls. The indications are that if spraying is thoroughly done late blight could be controlled even in the worst seasons at Rahangala and its environs.

The superiority of weekly sprays over the fortnightly treatments was vindicated not only as regards higher yields but also in the larger amount of Grade I tubers produced. The increased number of sprayings have been amply compensated in the profits obtained, hence the policy of spraying too often rather than too seldom is a sound one.

It will be seen that there was no demonstrable difference obtained as far as yields were concerned between the three fungicides used. There were, however, differences in appearance between the plants sprayed with Bordeaux mixture which were slightly larger in size and deeper in colour than the others. Slightly higher yields were also obtained from Bordeaux mixture although these did not reach the level of significance. Callbeck (4) found that the effects of 4-4-40 Bordeaux mixture and Perenox were the same in the control of late blight but that 4-1-40 Bordeaux mixture was superior to both.

In this connection it is relevant to remember that a high volume of spray was used (300 gallons per acre) with all the three fungicides and it is likely

Table VII—Yields of Potatoes of Grade III per Plot in Ounces (Yala 1952)

Blocks	*Perenox*		*Cupravit*		*Bordeaux Mixture*		*Control*	
	Weekly	*Fortnightly*	*Weekly*	*Fortnightly*	*Weekly*	*Fortnightly*		
I	120	80	96	96	72	72	88	
II	64	64	72	72	76	68	56	
III	72	56	64	52	40	80	72	
IV	72	60	60	56	64	64	88	
V	64	56	56	72	64	56	64	
Total	392	316	348	348	316	340	368	*Sig. diff.: ·05*
Mean	78·4	63·2	69·6	69·6	63·2	68·0	73·6	15·00

	Perenox	*Cupravit*	*Bordeaux Mixture*	*Sig. diff.: 0·05*
Mean	70·08	69·6	65·6	10·64

	Weekly	*Fortnightly*	*Sig. diff.: 0·05*
Mean	70·4	66·9	8·67

Treatments are not significantly different from the control.

No significant difference between Perenox, Cupravit and Bordeaux mixture.

No significant difference between weekly and fortnightly.

Table VIIA—Analysis of Variance

	Degrees of Freedom	*Sums of Squares*	*Mean Square*	*Variance Ratio*	*F. Value for Significance*		
					5%	*1%*	*0·1%*
Treatments	6	887	148	1·12	2·51	3·67	5·55
Blocks	4	3591	898	6·80 ‡	2·78	4·22	6·59
Error	24	3168	132				
Total	34	7646					

‡ Significant at 0·1 per cent.

that the plants received much more than the minimum copper necessary to ensure their protection from the fungus. Large, Beer and Patterson (5) have compared the spray retention capacity of certain copper fungicides and found that after 2-3½ inches of rain 1 per cent. Bordeaux mixture showed 40 per cent. spray retention while that of cuprous oxide and copper oxychloride sprays at the same copper dosage with water soluable dispersing agents was less than 20 per cent. They have also shown that effective spraying against blight under relatively severe incidence can be assured by maintaining a covering of not less than 0·5 mg. copper per 120 sq. cm. over the whole expanse of foliage. All fungicides tested afford equally good control, provided that sufficient applications are made according to the dosage and adhesive properties of the spray material, or both, so that the requisite concentration of copper is maintained. In the present experiments it is possible that the large spray volume and concentration used ensured the retention of at least the minimum copper deposit from all the fungicides used. There is little doubt that the rate of 300 gallons per acre could be considerably reduced without losing efficacy of the spray treatments.

During the experiments for the two seasons the incidence of plants affected by virus diseases has not been of sufficient importance to warrant the conclusion that degeneration of tuber quality occurred due to this cause. Certified seed was used for the first season and from this harvest seed was obtained for the second planting. The absence of a material difference in the yields of the two seasons further corroborates the above observation. On the other hand the very definite decrease in the amount of large tubers produced in unsprayed plots observed during both seasons is indicative of the fact that late blight if uncontrolled or inadequately controlled could cause not only a lowering of yields but also a progressive reduction in tuber size. There is little doubt that the same factor was largely responsible for tuber size reduction observed in previous potato cultivations at other stations mentioned earlier.

Although late blight is amenable to control in the Rahangala area continuous cultivation of potato is bound to bring in its train a number of other diseases for which control is much more difficult. Although the question of accumulation of virus diseases in the seed could be solved by frequent importation of certified seed, steps should be taken to see that bacterial, wart and other diseases do not become established in the soil. It is only with a keen appreciation of and strict attention to the prevention of these diseases that any large scale cultivation of potatoes should be undertaken.

Summary

1. Late Blight seriously decreased yields of potato at Rahangala during the *maha* and *yala* seasons.
2. Control of the disease is possibly by spraying with copper fungicides; weekly spraying being better than fortnightly applications.
2. The spray treatments not only covered the cost of treatment but produced considerable increased yields.

4. Late Blight when uncontrolled has been an important factor in the reduction of the average tuber size in previous potato cultivations under similar climatic conditions.

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