STUDIES IN BLISTER BLIGHT CONTROL

*PART IV. MECHANICAL DUSTING AGAINST BLISTER BLIGHT—SECTION 1.

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Research into blister blight (*Exobasidium vexans*) on tea has demonstrated the fact that this disease cannot be controlled once the fungus has penetrated the plant tissue. From this it will be seen that it is necessary to protect the young susceptible leaf tissue in the early stages of its growth. It is well known amongst planters that up to the present time copper fungicides have given the most efficient control of fungoid diseases, of which blister blight is probably the most serious. Effective control of the disease, in the early stages, can be achieved by using a spraying mixture consisting of four ounces of copper oxychloride in 8—10 gallons of water per acre, and distributed by knapsack sprayer. This method of spraying is both slow and laborious. These two disadvantages can, however, be overcome by the use of mechanical means to apply and distribute the fungicide.

The most efficient, even, and economical means for distribution of fungicides is possible by using a machine of the "Whirlwind" series, (The "Whirlwind-sprayer-misblower"; the "Whirldwind Duster," or the "Whirlwind Combination", the latter being available for use as a sprayer, a duster or for wet-dusting).

Experiments in Ceylon.

Experiments were first made with a "Whirlwind Combination" sprayer, using copper oxychloride (Cuprokylt) solution, and copper-oil mixture (Cuproil) on Mattakelle Estate, and dusting experiments with the "Whirlwind Duster"

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using copper dust (Cuprosana) on Castlereagh Estate. It was seen, however, that after about six week's time, the dusting method appeared to be more efficient in the control of blister blight on Castlereagh Estate, and consequently a change was made on some of the plots on Mattakelle Estate, and it is for this reason the "Whirlwind Duster" is described in this article.

The name "Whirlwind" has primarily been given to this dusting machine, owing to the fact that the main feature is the production of a whirling air or cloud effect imparted to the dust upon being expelled from the machine nozzle. This cloud of whirling dust rolls over and through the tea bushes, and in its rolling gently deposits a fine coverage of fungicidal dust upon the surfaces of the tea leaves and stems both near to and distant from the machine.

It will have been observed that other dusters do not possess this special feature of producing a whirling cloud effect, but blow a straight blast or jet of dusting chemicals through the tea bushes, which leaves a heavy deposit of fungicide on the first few rows near the machine, whilst the more distant bushes may receive no dust at all.

The engine is a light compact air cooled, four stroke petrol driven engine, with oil-bath air cleaner. The fan of the generator is fixed directly on the motor shaft, forming "one" rotating unit which is superior to any other form of drive.

In the "Whirlwind" dusting machine agitators are not necessary to convey the dust from the hopper to the generator. The dust falls, by its own weight into the air stream and is thus ultimately sucked into the generator.

The dust-hopper is capable of holding 100-140 lbs. weight of dust. The amount of dust discharged can be controlled by a lever from either side of the hopper at a rate varying from 0-35 lbs. per minute. The dusting can also be controlled by a change in the speed of the vehicle on which the duster is mounted.

The dust discharge takes place through the twin bend and outlet. This twin-bend-outlet-trunk consists of two parts, which rotate upon each other, and on the generator house. The component parts of the trunk are connected by special non-leak swivel joints, which permits the operator to rotate or turn the trunk in any desired position by the use of a direction-lever or ring. These features are highly important, owing to the fact that effective dusting must be carried out with the direction of the wind and, as the air currents are constantly changing, it will readily be seen that this mobility of the trunk is of the greatest consequence.

Experiments have shown that owing to the very small quantity of copper required for effective control of the disease, a specially prepared copper dust was necessary. This was manufactured and named "Cuprosana" dust. This particular dust has been proved to be most effective in the control of blister blight under all conditions of tropical weather.

The distribution of dust and the washing away by tropical rain, at varying distances from the point of application, have been investigated and compared in the field against other proved effective chemicals which were applied as sprays.

The results of the investigations were made possible by a rapid chemical micro-analysis for the determination of copper on tea leaves. The copper contents in the residues analysed are shown in Table I.

TABLE I.

Copper deposits remaining on leaves after spraying and dusting in the field.

Distance from machine.	SPRAYING				DUSTING					
	Heavy	Moderate		Light	Heavy		Moderate		Light	
	Cu p.p.m.				Cu p.p.m.					
25 ft.	2,349	1,130	593	172	4,175	2,716	967	508	245	149
1 day's rain	—	687	—	117	1,288	1,391	—	—	207	96
3 days' rain	1,425	586	250	99	[illegible]	[illegible]	268	178	181	59
125 ft.		251	83	—	362	232	181	169	148	141
1 day's rain		—	33	—	213	170	127	—	139	112
3 days' rain		162	—	—	113	—	66	51	127	51
200 ft.					361	195	122		135	
1 day's rain					103	77	67		49	
3 days' rain					84	101	66			
300 ft.					250				50	
3 days' rain					162				60	

These figures also demonstrate that the maximum working range of the spray is 125 feet, whilst that for the dust is considerably in excess of this figure.

As previously stated, it is a well known fact that with mechanical spraying and dusting the deposit on the leaves nearest the machine is generally heavier than that more remote.

Careful investigation has proved that heavy deposits of copper, both from spraying and dusting applications, are rapidly washed away leaving only a small basic level on the leaf for manufacture. Heavy roadside deposits can also be prevented when the dusting technique has been acquired by the operator. The following table demonstrates this.

TABLE II.

The range of copper deposits on flushes at various distances from the machine.

Distance from machine	Heavy Dusting. Cu p.p.m.		Moderate Dusting. Cu p.p.m.	Light Dusting. Cu p.p.m.
20-25 ft.	5,679	2,818	823	245
125-150 ft.	1,310	856	—	205
200 ft.	470	421	68	56
400 ft.	368	347	96	40

From a field, which was heavily dusted and uniformly covered to an approximate distance of 800 feet from the road on which the machine was operating, a number of flushes at varying distances in the field were selected for analysis with the following results. (Table III).

TABLE III.

The variation of the Cu. deposit on different leaves at various distances from the machine.

Distance.	Copper deposit in p.p.m.			
20-30 ft.	5,745	2,113	225	224
125-150 ft.	967	182	121	
200 ft.	251	83	77	
400 ft.	368	146	32	

After 5 days of rain and in bulk manufacturing of the tea this variation disappears.

It was proved in all experiments that, with skilled dusting technique and the diminishing of the copper content on the leaf in the period between application of the dust and plucking, the copper content in manufactured tea in bulk quantities was of a low order.

Note by Editor.

The necessity for rain between dusting and plucking to remove excess copper is emphasised. Moderate rainfall is sufficient to remove all excess dust and leave an active but unobjectionable deposit of copper.