

# CROP PROTECTION BY COPPER FUNGICIDES.

## PART II. COPPER RESIDUES IN RELATION TO QUALITY.

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First I wish to stress that the word quality used in the title of this paper covers all the properties which make tea acceptable to buyers. Even though a tea may have all the colour, strength, pungency and flavour one could hope for, it is of low quality if it contains foreign matter or does not conform to standards set by health authorities.

It is essential to appreciate the rules and regulations which govern the sale of foodstuffs and beverages in all modern countries. A century ago the adulteration of staple foods like flour and sugar was widespread even in the United Kingdom. Public agitation led to the framing of rules and regulations. Outbreaks of poisoning have been definitely traced to the presence of minute amounts of cumulative poisons such as arsenic and lead in foods, and so, as the study of public health advances, regulations become stricter and more precise. The product of our industry only receives scant attention compared to the staple foods but it nevertheless must conform to the rules and regulations.

I strongly advise you to dismiss all irresponsible ideas about propaganda for rival beverages as nonsense. The authorities responsible for public health are not influenced by propaganda, neither do tolerances and specifications vary greatly from one country to another. Furthermore, I advise you to bear in mind the fact that public health authorities have wide powers and you have no choice; you must either conform to regulations or risk having your product condemned as unfit for human consumption.

Copper is not regarded as a poisonous metal and indeed small amounts in the diet are essential to health. Copper vessels are commonly employed for treating food products and contribute to the copper content of foods. Copper based fungicides are widely used in treating crops and many products such as canned fruits and wines contain small amounts of copper as a result of such treatment. Public health authorities have to decide to what extent such additions of copper are allowable and naturally fix limits or tolerances as they are called, at such levels as they consider to be perfectly safe.

There is no need for secrecy about all these matters. We cannot fool the analysts who examine tea or persuade authorities to allow a tolerance which they consider to be in the least degree dangerous to public health.

We can however co-operate with the authorities concerted and that I have been doing to the fullest possible extent. I am sure the whole tea industry will endorse that attitude. The natural copper content of tea leaf is normally 25 to 30 parts per million but may occasionally be as high as 60 parts per million. Any tea containing more than 60 parts per million may therefore be suspected of containing additional copper resulting from processing or from spray residues.

Some months ago the Metallic Contamination Sub-Committee of the Food and Labeling Division of the Ministry of Food wrote to the Tea Research Institute stating that they were considering limits for lead and copper in tea and asked for any information we had on this subject. I was able to report that the tea industry in Ceylon had carried out all the necessary modifications in processing, necessary to conform to requirements with regard to lead in foodstuffs, in the years 1938-1939.

With regard to copper, I reported that although brass was used in tea machinery, its contribution to the copper content of teas was very small and gave all the available information about the natural copper content of tea leaf and the content of copper in manufactured tea.

At the same time I reported our results with the control of blister blight on tea in bearing by the use of copper fungicides and expressed the hope that we could be allowed a tolerance figure to cover the additions from this source should the Industry wish to adopt crop protection measures. I also pointed out that not more than 25 per cent of the total copper in tea leaf, whether inherent or otherwise, actually passed into the liquor when tea is brewed. The total copper content of packed tea is therefore to some extent misleading. Beer, for instance, commonly contains amounts of copper, which if present in the same volume of tea liquor would correspond to 400-500 parts per million in fired tea.

Now we must for a moment consider an altogether different aspect of copper residues. Not only have we to satisfy the public health authorities, but also the tea taster. If we spray tea in bearing there is always the possibility of tainting. Our experiments have shown that the wetters and spreaders employed in fungicides are equally or even more liable to cause taints than the copper compounds. For this reason, as well as for many others, we have been careful to specify the fungicides used in our experiments. Other fungicides are most probably equally satisfactory but we cannot be sure without actual trials over prolonged periods. We are not in a position to issue any list of approved fungicides and the whole subject is one of the greatest difficulty. We have not had time to consider the possibility of prolonged field trials with all the available proprietary preparations and I am frankly doubtful whether we ever shall.

With the preparations we have mentioned in our papers we have not had any reports of taints in samples of tea containing less than 150 parts per million.

Dr. Haworth has already given you the copper contents of the teas from our field experiments. Dry periods and slow growth between the application of fungicides, and the subsequent plucking, are the source of most anxiety. Even moderate rainfall washes off excess fungicides and in the normal monsoon weather, when blight is at its worst, there should be no difficulty with the effect of copper residues on quality.

Bearing in mind all the initial uncertainties and difficulties I asked the Committee to which I have reported whether a temporary tolerance of 150 parts per million could be allowed at least until such time as the industry adapts itself to crop protection routine.

A few weeks ago I received a cable indicating that a temporary tolerance of 150 parts per million would be allowed for the United Kingdom

market on the understanding that annual progress reports would be submitted, and that constructive efforts would be made eventually to work to a lower tolerance. Immediately on receipt of this information I organised this Conference and can now assure you that there are no purely technical difficulties in protecting Ceylon tea against blister blight.

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