

Effect of Indian Gums on the Stability of Emulsions of some Copper Compounds as Fungicides

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Some Copper compounds which are listed as representative effective fungicides in the literature have been tried as emulsion stabilisers. This work has been further extend to the study of the effect of addition of some Indian gums on the stability of these emulsions applying the size frequency analysis.

IN continuation with the previous¹⁰ work, the work has been extended to some copper compounds as emulsion stabilisers which have been used in the past against fungus diseases in the form of sprays, simply suspending them in water. The chemistry of these compounds has been given by different workers^{2-6,9,11}. Effect of addition of some¹⁰ gums has also been studied.

Experimental

Purification⁸ of gums and preparation¹ of emulsions was done as described earlier. The emulsions were made at 30° using fixed concentration of copper compounds and then by adding fixed amount of different gums, calcium oxide and sodium oleate keeping the ratio of oil to water as 20 : 80 in accordance with the view point of Mukerjee and Shukla⁸. The size frequency analysis was done immediately and on regular intervals of time of the ageing emulsions. The stability coefficients were computed from the data on specific surfaces of these emulsions applying the theory of least squares as described by Mukerjee and Shukla⁸.

Results and Discussion

From Table 1, it can be seen that when 0.5% of copper phosphate is used, the emulsion formed has an initial area of interface 14.43×10^3 sq. cm/g. oil. On addition of 8.05% gums Dhak, Bel and Katira respectively there is a very small decrease in the initial sp.

area values. The specific area decreases very rapidly in case of emulsion No. 27. Oil separation started just after 3 days. (1%) which increased to 8.5 % in two months storage time. Emulsion No. 28 broke just after 3 days. There was oil separation to the extent of 14 %, on 3rd day. Emulsion No. 29, where Bel gum has been used in combination with copper phosphate, the deterioration in specific area values was not rapid. There was improvement in the stability coefficient value as can be seen from Table 2. The stabilities in the other two cases of gum combinations were reduced.

TABLE 2—DATA FOR 20 % KEROSENE OIL EMULSIONS AT 30°

Sl. No.	Agent	Stability coefficient	Initial specific area(by garph)
27.	.5% Copper phosphate	28.05	11.22
28.	.5% Copper phosphate + .05% Dhak gum	1.24	14.18
29.	.5% Copper phosphate + .05% Bel gum	66.26	12.59
35.	.5% Copper phosphate + .05% Bel gum	70.57	7.41
41.	.5% Copper sulphate + .05% Bel gum	28.26	5.37

TABLE 1—SPECIFIC AREA AND SEPARATION OF OIL FROM EMULSIONS ON VARIOUS INTERVALS OF TIME. (SPECIFIC AREA IN SQ. CM/G OIL. ALL VALUES X 10³)

Sl. No.	Agent	Weeks→o	3/7	1	2	3	4	6	8
27.	.5% Copper phosphate	14.43 (nil)	10.04 (1.0)	9.32 (1.5)	6.55 (2.5)	6.12 (3.5)	5.06 (4.5)	3.21 (7.5)	2.36 (8.5)
28.	.5% Copper phosphate + .5% Dhak gum	14.18 (nil)	1.57 (14.0)	--- Broken ---					
29.	.5% Copper phosphate + .5% Bel gum	14.38 (nil)	—	11.11 (nil)	9.47 (nil)	8.89 (nil)	8.38 (nil)	7.89 (nil)	6.76 (nil)
35.	.5% Copper phosphate + .5% Bel gum	7.90 (nil)	7.83 (nil)	7.37 (nil)	7.18 (nil)	6.46 (nil)	5.76 (nil)	5.53 (nil)	5.35 (nil)
41.	.5% Copper sulphate + .5% Bel gum	5.55 (nil)	5.42 (nil)	5.27 (0,30)	4.45 (1.0)	4.29 (1.8)	3.47 (2,30)	3.33 (2,35)	3.00 (2,40)

Copper acetate did not produce stable emulsion. The emulsions produced by the combinations of gums with this agent were in general coarser as compared to the combination of these gums with copper phosphate. Dhak and Katira gums produced quite stable emulsions. The behaviour of Bel gum emulsion was nearly same as in case of copper phosphate so far as the specific area values and separation of oil are concerned.

Emulsions produced with copper acetate and different combinations have got the advantage that copper acetates leave much less noticeable deposit than Bordeaux mixture⁹.

Copper sulphate, Bel gum combination gave coarse emulsion and hence smaller value of interfacial area (Table 1), for emulsion No. 41. But the stability coefficient value being much less as compared to the stability coefficient values of 66.26 and 70.57, in cases of emulsions No. 29 and 35 respectively. Addition of sodium oleate with combination of copper sulphate and Dhak gum gave very fine and stable emulsions.

It is evident from the previous discussion that the emulsifying efficiency of these fungicides is very little except that of copper phosphate. Addition of Indian gums has a marked influence on the stability of these emulsions.

The addition of soap had an antagonistic effect which may be traced to a possible chemical reaction between soap and the combination of emulsifying agents. Calcium oxide had always a deteriorating effect.

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