XX. MAY WATER LOSS FROM PLANTS BE REDUCED BY FOLIAGE SPRAYS?

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Plants require a large amount of water for their growth and development. Most of the water used does not enter into the structure of the plant but is lost by evaporation from the surface of the leaves. This loss has sometimes been regarded as a necessary evil. Water frequently becomes the limiting factor for plant growth in many different sections of the United States and in other parts of the world. Various means of conserving and supplying water to plants have been applied, such as cultivation of the soil and irrigation.

Comparatively recent investigations by Martin, Dutton, Wells and others have shown that Bordeau Mixture, a fungicide used in disease control, will, when applied as a foliage spray, increase the amount of water used by plants. It is a poor rule that will not work both ways and considering the conclusions of Martin as establishing the fact that plants so sprayed do use more water the following question presented itself to us: "Why not reverse the process by spraying something on the foliage which would reduce the amount of water used by the plant, thus benefitting it by conserving the supply in times of need"?

A previous worker (a Mr. Boyer of Michigan State College) had in some preliminary work tested out numerous materials and found that milk, when applied as a spray reduced the amount of water used by plants. We started at that point, and separated milk into its various constituents such as butterfat, casein, albumen and salts, each of which was applied as a spray to plants and thus determined that the butterfat or oil was the thing which was responsible for the reduction in water loss. From this piont on different oils in the forms of varying concentrations were used as shown in the tables herewith presented.

Method of procedure:— The following plants were used: Jerusalem Cherry (Solanum capsicastrum), Cineraria sp., Apple (Pyrus malus), and Crab apple (Pyrus baccata x malus). All of the work was done in greenhouses in order to prevent the sprays being washed off by rains. Ordinary clay pots were prepared to receive the plants by painting the inside with paraffine and the outside with two coats of duco paint; this was done for the purpose of making the pots impervious to water. The plants were

taken out of the pots in which they had been growing and placed in the prepared pots, great care being exercised to avoid breaking up the clump of soil containing the roots. A glass tube one inch in diameter and eight inches long was then pushed down into the soil to within about two inches of the bottom of the pot and withdrawn, the core of soil rejected and the tube replaced. The top of the soil around the plant and tube was then sealed with a coat of paraffine extending out to make contact with the edge or rim of the pot. Thus the plant roots were completely sealed in and no water could be lost except through the leaves. The duco covering over the outside prevented the intake of water from that source. An ordinary cork stopper was placed in the top of the glass tube to prevent evaporation from that source. The potted plants were then weighed and brought up to a standard uniform weight by the addition of dry sand to the tops of the pots. They were then weighed at intervals of twenty-four hours and the loss of weight recorded as water loss. Water was added through the glass tube after each weighing to bring the plants up to the original weight.

Regular weighings were then made for a period of two weeks after which time the plants were divided into groups for the application of sprays, each group having lost approximately the same amount of water. After the sprays were applied the plants were weighed for a period of three weeks and calculations of water loss of control groups as compared to sprayed groups.

Spray	water loss compared to control
Experiment 1. Jerusalem Cherry **(Solanum capsicastrum)**	
Milk 3.5%	—15..2%
Milk without fat	+ 6.0
Milk - fat - Casein	— 4.0
" " " Albumen	— 7.3
Cream 20%	—30.1
" 38%	—42.3
Casein (Cal. Cas.)	— 6.6
Cream diluted with dist. water to test 3.5	—16.9
Cream diluted with (solution of milk-fat-casein)	—20.1
Experiment 2. **(Cineraria** sp.)	
Milk	—30.6
Wesson Oil Emulsion	—20.0
Sunoco	—26.9
Experiment 3. **(Solanum capsicastrum)**	
Linseed Oil Emulsion	— 7.8
Cotton Oil Emulsion	—12.19

Bordeau 4-4-50		— 1.44
Castor Oil Emulsion		— 6.33
Corn " "		—11.24
Mineral Oil "		—27.59
Soap (conc. used in making emulsions)		— 1.53
Bordo Oil Emulsion		— 7.98
Experiment 4. Crab Apple Trees		**(Pyrus baccatta)**
Bordeau Oil Emulsion	1%	—13.2
Corn " "	1%	—13.9
Mineral " "	1%	—33.4
Cotton " "	1%	—44.0
Experiment 5 Seedling Apple Trees		**(Pyrus malus)**
Bordeau Mineral Oil Emulsion	.8%	—11.7
" 5-5-50		+ 3.9
Volck (Miscible Oil)	.8%	—12.4
Mineral Oil Emulsion	.8%	—18.6

Note: All data herein presented were collected under the supervision of the Department of Horticulture, Michigan State College of Agriculture, East Lansing, Michigan, in partial fulfillment of tne requirements for the degree, Master of Science.