

water and the continuous surface of the leaf. The degree of perfection of the mirror indicates that here, too, the ratio of  $f_2$  to  $f_1$  must be great, and the values of the observed contact angles will be largely determined by this ratio. The diurnal and wilting variations observed by Fogg are therefore more likely to be due to changes in the physical structure of the leaf cuticle with its water content than to changes in the material of the cuticle.

A. B. D. CASSIE.  
S. BAXTER.

Wool Industries Research Association,  
Torriford,  
Leeds, 6.  
Nov. 8.

<sup>1</sup> Fogg, *Nature*, **154**, 515 (1944).

<sup>2</sup> Adam, "Physics and Chemistry of Surfaces", 186 (3rd ed., Oxford, 1941).

<sup>3</sup> Wenzel, *Ind. Eng. Chem.*, **28**, 988 (1936).

<sup>4</sup> Cassie and Baxter, *Trans. Farad. Soc.*, in the press.

### Presence in Raw Cow's Milk of a Bactericidal Substance Specific for Certain Strains of Coliform Organisms

DURING the course of an investigation as to the reason why certain strains of coliform organisms when inoculated into raw 'sterile' milk did not reduce methylene blue or resazurin, it was found that these organisms were actually destroyed in milk held at 37° C. for six hours<sup>1</sup>. As all the tests for the presence of a bacteriophage in the raw milk were negative, it was considered that the destruction of the organisms might be due to a specific bactericidal substance in the milk. The destruction of the organisms appeared to be closely correlated with the temperature at which the milk was held, so it was considered that the substance was probably not thermostable and further work was undertaken to find out the effect of heat on the substance. To do this, 'sterile' raw milk which had been heated to temperatures varying from 52° to 53° C. for half an hour was inoculated with young broth cultures of the susceptible strains of coliform organisms, so as to give an approximate inoculation count on MacConkey's agar of 500,000–2,000,000 organisms per ml.

Plate counts on MacConkey's agar were carried out at inoculation, and after holding the inoculated milk in a water-bath at 37° C. for four hours, with the following results:

Culture No.	Temperature to which milk was heated (for half an hour) before inoculation	Count per ml. at inoculation	Count per ml.
			after 4 hours at 37° C.
Culture No. 1	52° C.	1,328,000	1,000
	53° C.	848,000	40,000,000
Culture No. 2	52° C.	316,000	31,000
	53° C.	640,000	28,000,000

From these results it would appear that the bactericidal substance is completely destroyed by heating to 53° C. for half an hour, and that this destruction is critical to within 1° C.

All the cultures of susceptible coliform organisms were originally obtained from raw milk which the presumptive coliform test showed to contain coliform organisms in 1/1,000 ml. but which did not reduce methylene blue or resazurin after six hours incubation at 37° C.

The organisms were tested by the recognized differential tests to find if they conformed to any particular type, and the results of these tests showed

that the majority of the organisms were intermediate types.

C. S. MORRIS.

Advisory Dairy Bacteriological Department,  
Seale-Hayne Agricultural College,  
Newton Abbot, Devon.

<sup>1</sup> Morris, C. S., *J. Dairy Res.*, **13**, 115 (1943).

### 'Marsh Spot' in Beans

THE condition known as 'marsh spot' in peas has been proved by Piper<sup>1</sup>, using water cultures, to be due to manganese deficiency. An analogous condition in two varieties of broad beans (Wooster Mammoth and Jarvis) used for seed has been observed in the field in the United States by Orton and Henry<sup>2</sup>, who suggested that it resembled 'marsh spot' in peas, and by Furneaux and Glasscock<sup>3</sup> in broad beans grown for seed on Romney Marsh. Similar symptoms in runner bean seeds submitted by a seed firm have been reported by Pethybridge<sup>4</sup>, who suggested manganese deficiency as a possible cause, and by De Bruijn<sup>5</sup> at the Dutch Seed Testing Station in crops grown for seed.

During 1944, peas, *Pisum sativum* (var. Duplex), broad beans, *Vicia Faba* (var. Exhibition Longpod), runner beans, *Phaseolus multiflorus* (var. Scarlet Emperor) and French (dwarf) beans, *Phaseolus vulgaris* (var. Masterpiece), were grown at Long Ashton in manganese-deficient sand cultures, using a refined pot-culture technique, and the pods left on the plants until dry before harvesting. Examination of the seeds revealed typical severe 'marsh spot' in the peas, and mild to severe stages of a 'marsh spot' type of symptom in broad beans and runner beans, as illustrated; the middle of each cotyledon was sunken, brown and pithy, and the embryo in beans frequently showed browning of the plumule as noted by De Bruijn<sup>5</sup> in peas. The dwarf beans remained free from any signs of 'marsh spot'.

Typical leaf symptoms<sup>6</sup> (pale green, resembling a low nitrogen condition, with some faintly chlorotic mottling in runner beans and a more marked chlorotic mottling followed by severe interveinal necrosis and withering in dwarf bean) were developed, and



TYPICAL MARSH SPOT SYMPTOMS IN (ABOVE) RUNNER BEANS, (MIDDLE) BROAD BEANS, AND (BELOW) PEAS.