THESIS
Thermal Death-Point
of Micro-Organisms In
Spoiled Canned Fruit
Fleta Paddock
1901

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Michigan Agricultural College.

1901.

THE THERMAL-DEATH-POINT OF MICRO-ORGANISMS FOUND IN "SPOILED" CANNED FRUIT.

In order to determine whether the presence of micro-organisms in "spoiled" canned fruit is due to the heat resisting power of these micro-organisms, or comes about through ignorance or carelessness on the part of the person working with the fruit, the thermal-death-point of several bacteria and molds taken from canned fruit in different stages of decomposition has been ascertained.

Gelatine plates were made from the cans of fruit secured, and the colonies of bacteria and molds that appeared were carefully examined in order to determine the different kinds. After comparison by means of the hanging drop, moist chamber, stab cultures, and bouillon and milk tubes, six bacteria and six molds were isolated.

Germ A, which was isolated from a can of marmalade, is a micrococcus, and has a striking brown pigment. It grows slowly without liquifying the gelatine. Germ B was obtained from a can of peaches. A and B were the only germs that did not liquify gelatine, but B differs from A in other respects. It forms a ropy, white sediment in

bouillon. Germs C and D came from a can of pears. They are both Micrococci, and both liquify gelatine, but C liquifies it more quickly than D. In bouillon C becomes ropy, while D forms a flaky white sediment easily disturbed. C solidifies milk. E and F came from a can of apples. E was isolated from below the surface and F from the surface. E liquifies the gelatine very slowly. Like C, it coagulates milk, but,unlike C, it causes the milk to remain in a solid form. E and F are micrococci found both singly and in pairs. F liquifies rapidly and has a yellow pigment. It forms a little sediment in the bottom of bouillon tube which is not easily shaken up.

Molds A and B came with Germ E from beneath the surface of the can of apples. Molds C and D were obtained from a can of peaches. These four molds are varieties of Penicillium. Mold E came with Germ F from surface of a can of apples. Its spore formation differs from that of Penicillium and resembles Botrytis. Mold F came from below the surface of can of apples. It is a dark brown mold and has a peculiar spore formation differing from that of all the other molds.

Twelve fresh bouillon cultures were made of

these bacteria and molds preparatory to the determination of the thermal-death-point. Twelve tubes of bouillon were then placed in a hot water bath and raised to a temperature of 55° Centigrade. These were inoculated from the twelve tubes of bacteria and molds. They were left in the bath five minutes after inoculation with a constant temperature of 55° C. They were then removed and immediately cooled. After ten days, during which the tubes had been in a temperature favorable to the growth of these micro-organisms, they were examined for traces of growth. All had grown but Mold F. The experiment was repeated with the other molds and the bacteria, but at a higher temperature. This was continued until all were killed. The temperature at which each micro-organism was killed is shown in the following table.

	55°	60°	65°	70°	75°	80°	85°	90°	95°	100°
Bacteria										
A	−	−	−	−	−	−	−	−	+	"
B	−	−	−	−	−	+	"	"	"	"
C	−	−	−	−	−	+	"	"	"	"
D	−	−	−	−	−	−	−	−	−	+
E	−	−	−	+	"	"	"	"	"	"
F	−	−	−	+	"	"	"	"	"	"
Molds										
A	−	+	"	"	"	"	"	"	"	"
B	−	−	+	"	"	"	"	"	"	"
C	−	+	"	"	"	"	"	"	"	"
D	−	+	"	"	"	"	"	"	"	"
E	−	+	"	"	"	"	"	"	"	"
F	+	"	"	"	"	"	"	"	"	"

The molds were killed at a lower temperature than the bacteria. Mold F was killed at 55°, A, C, D and E at 60°, and B at 65°, while the bacteria resisted heat until 70° was reached, when E and F failed to grow. B and C were killed at 80°. A and D were the most obstinate, but were killed at 95° and 100°, respectively.

As all these micro-organisms may be killed by boiling (100° C) it follows that their growth in the canned fruit was not due to the heat resistant power of the micro-organisms, but to the lack of knowledge of, or carelessness in, the operation of canning. Sufficient care was not given to the cleanliness and sterilization of cloths and utensils used, thereby allowing free access of the low forms of plant life.