Strains closely resembling the following species were obtained: *B. arenarius*, *B. vulgatus*, *B. panis*, *B. borstelensis*, *B. fusiformis*.

In the sections, the ingested and intracellular organisms were Gram-positive bacilli of varying sizes; many were spore bearers, and cells showing partial decolorization and irregular outline, probably implying digestion, were seen. One very large bacillus was present which resembled none of the strains isolated; spores were not demonstrated. The majority of these organisms, including the large bacillus and all types of spore bearers, gave the typical blue reaction with iodine[5].

Comparisons with the morphology of the strains cultured makes it appear highly probable that they include at least some of the species that *in vivo* are iodophile. So far, all attempts to render them iodophile *in vitro* have failed, but this reaction is still being investigated. It seems that these strains may be common organisms of the *Bacillus* group, and that under *in vivo* conditions they acquire the capacity for polysaccharide synthesis.

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Maximum Rate of Selection for Dominant Quantitative Genes

THE following formulæ are proposed to measure the maximum rate of progress of selection for dominant quantitative genes. To simplify the problem, certain assumptions are made: (1) Selection begins in the F_2 generation of a cross between two pure lines. (2) All genes are dominant in the positive direction. (3) Environmental effects are ignored, selection always being for the phenotypic class of maximum expression. This determines the maximum rate of progress, which would never be attained in actual practice. (4) All genes have either equal additive effects, when data are treated arithmetically, or equal geometric effects, when data should be treated logarithmically.

Let k be effect of each gene; n the number of genes segregating; $m = 0$ represents the mean of the F_2 generation in all cases; g is generation of selection; P is mean of selected generation minus mean of F_2 generation.

Then P increases with the generation of selection and the number of genes segregating, but the formulæ for determining P will vary according to the system of breeding.

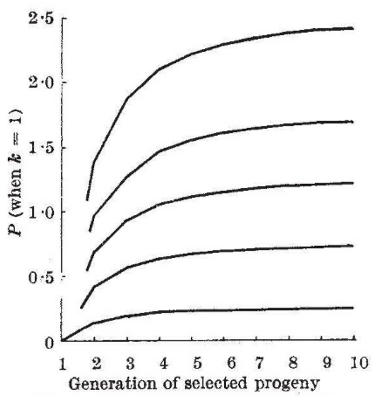

Fig. 1. RANDOM-BRED POPULATION

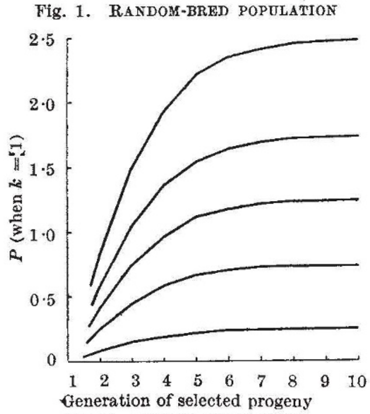

Fig. 2. INBRED POPULATION

In a random-breeding population,

$$P = nk\left\{\frac{(g+1)^2 - 4}{(g+1)^2 \cdot 4}\right\}; \quad . \quad . \quad . \quad \text{(i)}$$

the distribution of each generation being

$$\{1 + (2g + g^2)\}^n. \quad . \quad . \quad . \quad \text{(ii)}$$

In a self-fertilized population,

$$P = \frac{nk\,(2^g - 2)}{4\,.\,(2^g + 2)}; \quad . \quad . \quad . \quad . \quad \text{(iii)}$$

the distribution of each generation being

$$\{1 + (2^g + 1)\}^n. \quad . \quad . \quad . \quad \text{(iv)}$$

Figs. 1 and 2 illustrate graphically the rate of progress of selection for $n = 1 \rightarrow 10$ for random breeding and inbreeding respectively.

It is doubtful whether such formulæ could be used to estimate numbers of genes from experimental data. They are of value, however, in demonstrating that selection for quantitative characters may proceed, after a few generations of rapid progress, by steps which are only a small fraction of a single gene difference. The relative size, $k = 1$, of a single gene difference, that is, the difference between aa and AA, is shown in the diagrams. It should be noted that the mean of an F_2 generation, when all genes are dominant in one direction, is $\frac{3nk}{4}$; this has been adjusted to 0 in the above discussion.

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Control of *Boophilus australis* in the Argentine by the Gamma Isomer of Hexachlorocyclohexane ('Gammexane')

DURING the last ten years or so, difficulties have been experienced in the Argentine in obtaining complete control of the common cattle tick, *Boophilus australis* (syn. *microplus*). Similar difficulties have been observed in other countries, especially South Africa, where arsenical resistance is stated to have been proved.

Recent trials were carried out with dips containing the gamma isomer of hexachlorocyclohexane ('Gammexane') and the results show that complete tick control can be obtained.

At bath concentrations of 1 : 50,000, 1 : 33,000 and 1 : 17,000 of the gamma isomer, the number of ticks per animal is substantially reduced. Furthermore, the oviposition of engorged females is somewhat reduced, though the proportion of larvæ emerging from the eggs is usually more than 95 per cent. At 1 : 8,000–1 : 4,000, practically all engorged females drop off the animals within the first 24 hours after dipping, and all small females, males and larvæ are either killed or very affected. Six days after a double dipping at 1 : 4,000 of the gamma isomer in the wash the animals were free of tick, but not those dipped at 1 : 8,000. At these concentrations oviposition of the engorged females was still not greatly reduced, and 95 per cent or more of the eggs hatched normally. A double spraying with washes containing 1 : 1,700 and 1 : 830 of the gamma isomer not only cleaned the animals but also affected the engorged females and completely prevented oviposition.

Trials in which the isomer was incorporated with a plain arsenical dip with 0·2 per cent As_2O_3 showed that at 1 : 17,000 oviposition was very incomplete and a high proportion of the eggs was sterile. At 1 : 8,000 all the engorged females detached themselves within 24 hours and no oviposition took place. A single dipping with these two preparations did not completely clean the animals, but at the higher concentration of the gamma isomer control was very satisfactory.

Concentration of gamma isomer	Animals freed of ticks	Oviposition	Eggs hatching (%)
1 : 50,000	Not in a single dipping	Abundant, but incomplete	98
1 : 33,000	,, ,,	,,	80
1 : 17,000	,, ,,	,,	98
1 : 8,000	Not with double dipping at 14 days interval	,,	95
1 : 4,000	Clean 6 days after double dipping at 14 days interval, but result not constant	,,	98
1 : 1,700	Clean 5 days after second dipping at 14 days interval.	None	—
1 : 830	,, ,,	None	—
0·2% As_2O_3 plus 1 : 17,000	Not in a single dipping	Very incomplete	Practically none
0·2% As_2O_3 plus 1 : 8,000	Almost complete in a single dipping	None	—
0·2% As_2O_3 alone	Not after several dippings at 8–14 days interval	Incomplete	Up to 66, from ticks collected the 7th day after dipping

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