2. The structure of indigenous and other synthetics.

Our studies of indigenous races lead us to conclude that they represent what is generally called today a balanced synthetic, i.e., a population which under a given type of mass selection maintains its hybrid vigor and does on the whole not suffer from natural inbreeding. Furthermore, since inbreeding causes immediately a very significant loss of vigor, it must be concluded that we are dealing with a system of heterotic factors where any degree of homozygosity already sets very strongly. As has been shown (Brieger in "Handbuch of Pflanzenzüchtung," Parey-Berlin 1955), panmixis produces in such a system the inevitable appearance of some homozygotes of various degrees, and if they should reach maturity, the total yield of the mature plants, heterozygotes and homozygotes combined, will be below the maximum yield possible, if there were only heterozygotes. This loss of yield probably does not appear in the indigenous synthetics, since here plant vigor is already so affected by any degree of inbreeding that these homozygotes will usually not reach maturity. Thus in synthetics the loss actually consists of those plants which are eliminated either by natural competition or by roguing, and the yield of those plants which reach maturity will not differ much from the maximum yield. This conclusion induced me to postulate (Genetics 1950) that the best method for obtaining commercial synthetics is to combine inbreds with a high combining capacity but with a low inbreeding minimum. It must, however, be admitted that such synthetics will have considerable disadvantages. Their yield must remain well below maximum if no strong roguing is carried out, which would in turn require a rather dense sowing to guarantee full stand even after intensive roguing. Thus there will be a serious lose, either by having to plant an excessive number of seeds or by having below maximum. yields. If, on the other hand, lines are used with a rather high inbreeding minimum, the homozygotes formed by panmixis will cause a certain loss in yield of the synthetic when compared with hybrids. However recent data on synthetics have shown that this loss is not necessarily serious. Thus I have to correct my suggestion, and this correction is being made in our breeding program, that lines with a maximum combining ability and a good performance as inbreds should be used.

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