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### **Two technologies of maize breeding on the basis of parthenogenesis**

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As it has been shown in our research, there exist two different mechanisms of haploids origination. The first is connected with specific features of male gametophyte and it leads to a unitary fertilization. On this basis we created haploinducing lines, which usage as pollen parents leads to haploids originating with frequencies up to 10 % and above. The second mechanism is associated with parthenogenesis, controlling by nuclear factor of maternal plant. It was proved by the method of genetic marking and by cytoembryological analysis. The part of the data was published (Tyrnov, 1983, 1994, 1997, 2000, 2002, 2007). The frequency of parthenogenesis, as a rule, reached of some dozens of percents, up to 100. We considered it as a good precondition for further work on synthesis of unreduced obligate and facultative apomixes. However, the possibilities of heritable reduced parthenogenesis use for production of both haploids and derivate diploid homozygous lines did not seem to us enough perspective ones. It was connected with that a great number of haploids would be produced in field by heritable reduced parthenogenesis, that should limit possibilities of their commercial use. It was not clear, if it is possible to produce effectively and quickly the new parthenogenetic lines – analogies, necessary for new hybrids production. Later it has been ascertained:

- 1) an ability to parthenogenesis can be transferred to progeny by egg and pollen;
- 2) the signs and conditions have been discovered, which allow to make effective selection on parthenogenesis and produce of new lines;
- 3) the simple and reliable genetic system has been worked out, which give an opportunity to produce with high frequency (dozens of percents) matroclinic haploids on the first stage, i.e. by homozygous lines development; by this about 3-10% matroclinic diploids produce additively, which in accordance to some data are spontaneously diploidized haploids;
- 4) system has been worked out accordance to which haploids in the commercial hybrids progeny are produced in field with a frequency about 0,3-1,0%. It is some what higher than an average frequency for maize – 0,1%. However, it does not influence appreciably on a common yield. At the same time the origin of some number of haploids in field can be of the positive importance. Haploids can be in future the initial material for selection since by descending from hybrids and undergoing of hard selection in the field conditions they can be the bearers of the new valuable genetic combinations. Besides, by of using a number of methodical modes, it can be possible to produce haploids with the high frequency in commercial hybrids as well.

Thus, our technology allows regulating of parthenogenesis frequency from insignificant to very high values.

There is one more advantage, working for a perspective. Apomixis, with the help of which fixation of heterosis and other unique traits in the hybrid progeny is supposed to realize, is more probably multicomponent phenomenon, including apomeiosis, normal development of endosperm by untypical conditions (different ploidy, genomic imprinting) and parthenogenesis. Parthenogenesis presence in a great number of cultivated hybrids facilitates significantly the decision of the other parts of the problem that we have demonstrated in the model experiments.