Haploid Formation by X-rays in *Triticum monococcum* *

By

Yoshiwo Katayama

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KIHARA and KATAYAMA (1) reported the occurrence of three haploid individuals in *T. monococcum*. These haploid plants were raised from seeds of bagged spikes as well as from those of spikes exposed to X-rays at the period of meiosis. But no explanation was given as to the causes of the appearance of these haploids. In order to find its causes, certain experiments were made and many haploid plants were obtained by X-ray treatment in this year (1933). The conditions of the treatment were as follows: COOLIDGE tube with tungsten anticathode, kilovolts 40, milliamperes 2, distance from the anticathode 30 cm., aluminium filter 1 mm., exposure 30 minutes.

Haploid plants appeared also in the field of ordinary cultivation, their number being shown in Table 1. So it can be said that the eggs of *T. monococcum* are sometimes able to develop parthenogenetically. This is in conformity to the previous observation of the writer (2) that many egg cells were found divided to form small parthenogenetic embryos in ovaries of *T. monococcum* fixed 9 days after emasculation.

Table 1. Haploid occurrence in the field of ordinary cultivation (1933).

Total individuals	Haploids	%
1243	6	0.48

When young spikes which were estimated as being in the period of meiosis were treated by X-rays, the rate of occurrence of haploids increased somewhat as seen in Table 2.

* Contributions from the Laboratory of Genetics, Biological Institute, Kyoto Imperial University, No. 39.

Table 2. Haploids raised from the seeds of spikes X-rayed at the period of meiosis.

	Year observed	Total individuals	Haploids	%
Spikes were bagged after heading	1932	38	2	5.26
Pollen was given to normal pistils	1933	27	2	7.41

Many haploids were obtained, however, from the following experiment. Spikes with ripe pollen grains were X-rayed and the pollen from these spikes were immediately pollinated by the usual method to pistils which were emasculated 3 days before. The result is shown in Table 3 together with that of the pollination where X-rayed pistils and normal pollen were used.

Table 3. Formation of haploid plants by X-rayed pollen (1933).

	Total individuals	Haploids	%
X-rayed pistil $\times$ normal pollen	21	0	0.00
Normal pistil $\times$ X-rayed pollen	91	16	17.58

Seven univalent chromosomes in PMC of such haploids are seen in Fig. 1. Some haploid plants growing in the field are shown in Fig. 2.

Fig. 1. First meiotic figures from PMCs in a haploid plant. Seven univalent chromosomes. 1a, metaphase. 1b, anaphase. $\times$ ca. 1600.

As the above table shows, we could not obtain any haploid if X-rayed pistils were pollinated with normal pollen. From this fact we see that the germ cells cannot be activated to develop embryos by exposure to X-rays.

Generally, it is considered that some male nuclei derived

Fig. 2. Diploid and haploid plants in the field. Marked plants are haploids and others diploids.

from pollen or PMC which was X-rayed degenerate without fusing with egg nuclei, if they entered the ovule. But, by the stimulation of male nuclei, egg nuclei may have been activated to develop parthenogenetically. It may be conjectured also that the endosperms developed through either the similar process in the egg or normal triple fusion. In the emasculated female flower of *T. monococcum*, the writer (2) could not yet observe the division of polar nuclei. So the easy development of endosperms may have an important significance to the haploid formation in *T. monococcum*.

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Literature

- (1) Kihara, H. und Katayama, Y. 1932. Über das Vorkommen von haploiden Pflanzen bei *Triticum monococcum*. (Japanese). Kwagaku, Tokyo 2.
- (2) Katayama, Y. 1933. Crossing experiments in certain cereals with special reference to different compatibility between the reciprocal crosses. Mem. Coll. Agr., Kyoto Imp. Univ. No. 27.