NOTES ON INDUCED POLYPLOIDS IN THE TUBER-BEARING *SOLANUM* SPECIES AND THEIR CROSSABILITY WITH *SOLANUM TUBEROSUM*

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Chromosome doubling was induced at this Laboratory in a few wild *Solanum* species and species hybrids with the following aims: (1). to double the chromosome number of some 24-chromosome species, possessing characters valuable from the breeding point of view, in order to cross them with *S. tuberosum* at the tetraploid level. Similar work has been done earlier by Johnstone (1939) and Livermore and Johnstone (1940). (2). to produce material with \(2n=96\) out of certain 48-chromosome species which do not normally cross with *S. tuberosum* readily, in order to use them in breeding. Lamm (1943) found that crosses between *S. acaule* and *S. tuberosum* can be effected easily, if the doubled plants of the former species are used as female parents. (3). to produce amphidiploids out of sterile species hybrids. *S. artificiale* produced by Toxopeus (1947) from the sterile hybrids of the cross *S. chacoense* x *S. antipoviczii* seems to be the only *Solanum* amphidiploid that has so far been produced.

**MATERIALS AND METHODS**

The following is the list of the material used in this experiment and the breeding value of each of them.

1. *S. chacoense*, \(2n=24\). Some varieties of this species are known to possess resistance to the colorado beetle (Schick, 1937; Stelzner, 1943, a, and Torka, 1949) and further they are also scab immune (Reddick, 1939). Livermore and Johnstone (l.c.) observed that doubling increases its crossability with *S. tuberosum*.

2. *S. kesselbrenneri*, \(2n=24\). (Commonwealth potato collection No. 819. This species has a short rest period (Stevenson and Clark, 1937). The tubers mature early and have a short rest period (Stevenson and Clark, l.c.). A few \(F_1\) plants of the cross *S. rybinii* x *S. tuberosum* that have been observed were absolutely sterile.

3. *S. rybinii*, \(2n=24\). (Commonwealth potato collection No. 546). Some varieties of this extremely variable species exhibit resistance to virus Y. A few \(F_1\) plants of the cross *S. rybinii* x *S. tuberosum* that have been observed were absolutely sterile.

4. *S. polyadenium*, \(2n=24\). Black (1944), in studies on breeding varieties possessing blight-resistance with field immunity to viruses A and X,
reports that *S. polyadenium*, which is blight immune and is very repulsive to green flies, showed greater disease-resistant properties than any other potato species. According to Stelzner (1949), the doubled plants of *S. polyadenium* can be readily crossed with *S. tuberosum*, the resulting hybrids being resistant to the colorado beetle, *Phytophthora* and Y virus.

5. *S. acaule*, 2n=48. This is a valuable species owing to its high frost resistance, though not much breeding work in this direction has been done and no results of any practical value seem to have been obtained so far. The variety Recoba and the hybrids of the reciprocal cross Recoba x Bukasov were used for doubling purposes. Stelzner (1943b) has suggested that it will be worthwhile to use inter-varietal hybrids of this species in breeding.

6. *S. longipedicellatum*, 2n=48. (Commonwealth potato collection No. 28). This species has been found to be resistant to a series of *Phytophthora* biotypes isolated in Holland (Toxopeus, unpublished), but crosses with *S. tuberosum* have not been successful so far.

7. F₁ *S. macolae* x *S. simplicifolium*, 2n=24. *S. macolae* is resistant to the colorado beetle (Stelzner and Torka, 1948) but crosses with *S. tuberosum* were unsuccessful. However it crossed readily with another 24-chromosome species, *S. simplicifolium* and at the time this experiment was started it was not known whether the F₁ hybrid was fertile or not. Even if the F₁ was fertile, it was considered desirable to produce the amphidiploid so that they can be crossed with *S. tuberosum* at the same chromosome number level also.

8. F₁ *S. acaule* x *S. simplicifolium*, 2n=36. It became necessary to produce the amphidiploid, as the normal F₁ had been found to be totally sterile.

The techniques employed in this experiment have been described in detail elsewhere (Der Züchter) and hence will only be briefly mentioned here. Of all the different colchicine treatment methods tested, the colchicine-agar seed treatment proved to be very successful, the percentage of doubled plants obtained varying from 20 to 50 in the different material. The outline of the method is as follows: Seeds are germinated in sterilized petri dishes on a colchicine-agar jelly comprised of equal parts of 0.5 per cent colchicine and 2 per cent agar at ± 12°C. Soon after germination, when the root tips are 3 to 4 mm. long, the young plants are washed thoroughly in water and transferred to another petri dish with moist filter paper. When the first leaves appear, the plantlets are transplanted into soil.

The doubled plants were generally recognized by a study of characters like general growth habits, leaf thickness and length-breadth index, stomatal size and frequency, pollen size and fertility etc. In many cases the polyploid condition has been confirmed by chromosome counts in leaf tissues as only chromosome counts provide the final criteria of the