PATRON OF CHIP COLOUR SEGREGATION IN SOME CROSSES OF POTATO

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ABSTRACT: Pattern of chip colour distribution in the progenies of six crosses was studied in the first clonal generation at CPRS, Kufri. Chip colour distribution varied with cross combinations and frequency of getting excellent chip colour (score 1) was very low (1-5%) in these progenies. Clones with acceptable chip colour were obtained from both types of crosses i.e. good x good chipper and good x poor chipper, but the colour score was better in the latter. Cross combinations MP/97-583 x JEX/A-680-16, MP/97-628 x CP 2417 and MP/97-921 x CP 2132 produced higher percent (40%) of clones with lighter chip colour (< 3) and could be exploited for developing varieties for processing.

Potato varieties for processing into chips need to have some essential qualities like round tubers, shallow eyes, high dry matter (>20%), low reducing sugars (<150 mg/100 g fr.wt.) and acceptable chip colour (Ezekiel et al., 1999). While dry matter content influences the yield of processed products, sugar content determines the colour of the fried products (Ezekiel et al., 1999). Chips prepared from potatoes containing large amount of sugars turn brown and become unacceptable to the consumers. While breeding varieties for processing, rejections in seedling (F1) stage are made on the basis of tuber shape, eyes depth and tuber colour. Selections in first clonal generation (F1C1) are mainly based on specific gravity (>1.080) and chip colour (Luthra et al., 2006). As chip colour decides the final selection of a clone, the knowledge of the pattern of segregation of this trait may be useful to breeders while selecting the parents because choice of the right parents is the first important step in the success of a potato breeding programme (Gopal, 2006). Hence, the present study was conducted to know the pattern of chip colour (on 1-10 scale, 1= most acceptable, 10= least acceptable) in the progenies of six crosses.

Three crosses (MP/97-1008 x MP/92-35, MP/97-1008 x MP/97-784 and MP/97-583 x JEX/A-680-16) had both parents with chip colour score less than three and three crosses (MP/97-583 x CP 2184, MP/97-625 x CP 2417 and MP/97-921 x CP 2132) with female parents having chip colour less than 3 and male parent with chip colour 6 were produced during summer, 2004 at CPRS, Kufri. Seedlings (F1) from all the 6 crosses were raised in the polyhouse during winter 2004-05 and tubers were harvested in 500 randomly selected single plants (clones). Five tubers of each clones (F2C1) were planted along with parents in 1 m row plot at spacing of 60 cm between rows and 20 cm between plants during summer 2005. Immediately after harvest, each clone was tested for chip colour. The tuber slices were fried until the bubbling ceased and chip colour was assessed visually on five tuber slices per clone. Chips with colour score from 1 to 3 were considered highly acceptable. The percent clones with different chip colour score were calculated for each cross.

Chip colour ranged from 1 to 8 in the progenies of these crosses and it varied from cross to cross (Fig. 1), but none of the progenies produced darkest chip colour (score 9 and 10). It may be because that at least one of the parents used was advanced processing hybrid already selected for its low chip colour through recurrent breeding. Secondly, the tubers usually have low reducing sugar content immediately after harvest as compared with cold stored tubers (Ezekiel et al., 2003, Pandey et al., 2005). The progenies of good x good chip crosses had chip colour ranging from 1 to 6 as compared with from 1 to 8 in the good x poor cross combinations.

In the progenies, percent acceptable chip colour (<3) ranged from 22.5% (MP/97-1008 x MP/97-35) to 53% (MP/97-625 x CP 2417). Comparison of means of good x good and good x poor chipper cross combinations revealed that the later had more percent progenies (40.1%) of acceptable chip colour than the former (29.3%). In the good x good crosses, both the parents used were advanced hybrids having common
parents in their pedigree except for JEX/A-680-16 and in the good x poor chipper crosses females were advanced hybrid and males were germplasm accession with higher dry matter, as a result the heterozygosity for chip colour might have been transmitted from male parents (Capo et al., 2002).

Ezekiel et al. (2003) categorized the acceptable chip colour into three groups: excellent (score 1), very good (score 2) and good (score 3). Accordingly, in the present study, the percent progenies with excellent chip colour ranged from 1 to 6%; very good chip colour was from 5 to 23% and good chip colour from 15 to 30% (Fig. 1). It is a clear indication that even though getting excellent chip colour clones in the progenies was very low getting clones with very good and good chip colour were more and further selection from them for desirable processing attributes like shape, eye depth, dry matter, reducing sugars and yield, may end up with promising processing hybrids/varieties. Among the six crosses tested, MP/97-625 x CP 2417, MP/97-583 x JEX/A-680-16 and MP/97-921 x CP2132 had large percent of segregants with desirable chip colour (Fig. 1). When the female parent MP/97-1008 was crossed with two advanced cultures (all three having some common parents in their pedigree), the progenies showed similar pattern of segregation for chip colour.

The pattern of chip colour in good x good combination followed near normal distribution with slightly skewed towards right (higher chip colour side) and whereas, in good x poor combination it was slightly towards left (lower chip colour side) (Fig. 2).

![Fig. 2. Distribution of chip colour score in the progenies of good x good and good x poor chipper](image)

In most of the crosses, the maximum percent progenies (>50%) had chip colour of 4 and 5 (medium chip colour) and the frequency was low for lighter colour and darker colour. If in a particular cross combination, the frequency of excellent, very good and good were low, breeder can select the clones with chip colour score up to 4, which was also considered acceptable by Ezekiel et al. (2003). This may help in avoiding the loss of valuable clone in the early stage as they may improve their chip colour and stabilize in the advanced generations, because environment largely influences the chip colour (Thill, 1994, Thill and Peloquin, 1994, Capo et al., 2002).

**Literature cited:**


