

キクの緩照射と花器培養による再分化個体の花色変異

Flower Color Mutants Derived from Floral Organ Cultures of Chronic Irradiated Plants in Chrysanthemum

栄養繁殖性花き類の放射線育種では、花や花弁に花色の変異セクターが現れても、突然変異体を分離することは困難な場合が多い。その改善のため、花弁や蕾などの花器培養法を適用して、変異セクターから非キメラ性花色変異体を高い頻度で得る方法を開発した。

キクの幼苗をガンマフィールド内に定植し、1日20時間当り25-150Gy(2.5-15kR)で、100日間緩照射をした。線量の増加に伴って、花弁や花に変異セクターの頻度が高まった(図1)。緩照射植物から花色が種々に変異した花弁および蕾をとり、また比較のために無照射植物の花弁を加え、それぞれMS修正培地に植付けてカルスを誘導・継代し、再分化個体を養成した。



図1 花弁に現れた変異セクターとその花弁培養。

Fig. 1. Mutated sectors appeared on flower after irradiation and the floral petal culture on media.

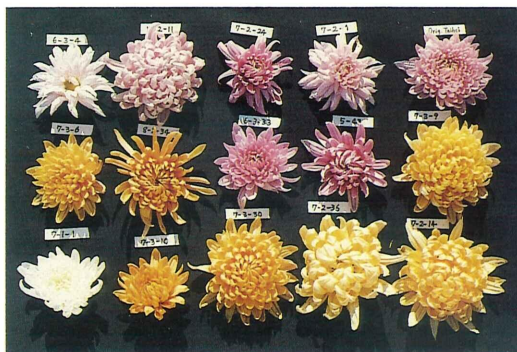


図2 緩照射・花弁培養の再分化個体に誘発された花色変異体。原品種：右上，他は変異体。

Fig. 2. Flowers of the mutants derived from petal culture of chronic irradiated plants. Donor: upper right.

一方、対照区として、緩照射植物から冬芽をとり通常の個体レベルの栄養繁殖により苗を養成し、変異の発現を調査した。

培養開始後、1年目の秋期には全個体に開花がみられ、花色は原色の桃色から、濃淡の桃色、白、黄、オレンジ、黄褐、黄桃斑など幅広い変異スペクトルが得られ、変異は再分化個体ごとに発現された(図2)。また、花弁培養と蕾培養による変異体では、花色のほか花のサイズや形状および葉の形状にも連続した変異がみられた(図3)。培養花弁の色とその再分化個体の花色との間には密接な関連性は認められず、外見上正常な桃色花弁からも変異花が出現した(図4)。

手法別の花色変異率は、花弁培養39.0%、蕾培養37.5%に対し、従来の個体レベルの緩照射では4.5%で、花器培養法による前2者は後者に比べて8倍以上の高い変異頻度を示した(図5)。一方、無照射株の花弁培養からは変異花は得られなかったことから、緩照射と花器培養による変異体は、放射線により誘発され培養により拡大されたものと判定された。

緩照射と培養を複合した突然変異育種法は変異頻度が高く、スペクトルも大幅に拡大し、非キメラ性の完全変異体が得られるなど、従来の突然変異育種法を改善できた。(永富成紀)

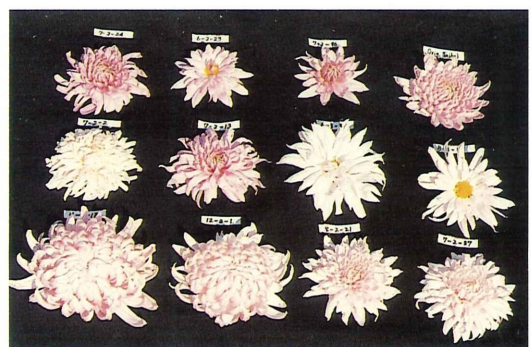


図3 緩照射・花弁培養の再分化個体の花型およびサイズの変異。原品種：右上，他は変異体。

Fig. 3. Flower types and size on the same regenerators as in Fig. 2. Donor: upper right.

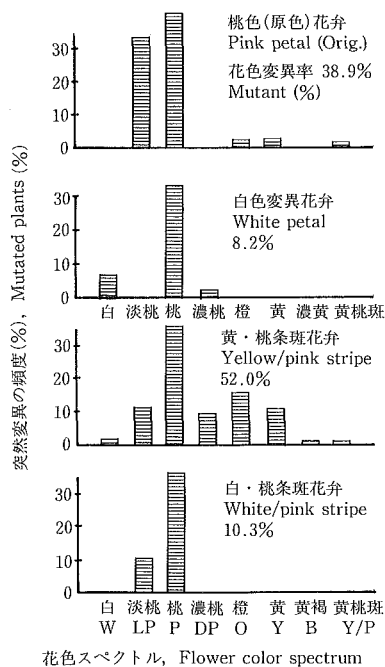


図4 培養花卉の変異セクターの色と再分化個体の花色との関連性。

Fig. 4. Association between sector coloring of cultured petals and color spectrum of their regenerators.

Color spectrum : W : white, LP : light pink, P : pink, DP : dark pink, O : orange, Y : yellow, B : bronze, Y/P : yellow & pink stripes.

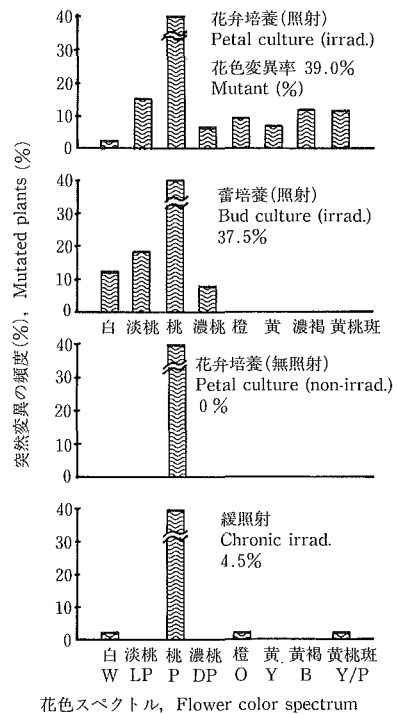


図5 誘発手法による花色変異スペクトル出現率の比較。

Fig. 5. Comparison of spectrum and flower color mutants among the induction techniques. Abbreviation of spectrum : refer to Fig. 4.

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It is usually difficult to isolate mutant from mutation sectors appearing on flowers in radiation breeding of vegetatively propagated flower species.

An effective method was established to obtain non-chimeral mutants in various flower colors, regenerated from floral organs on which mutated sectors appeared in chronic irradiated plants.

Young chrysanthemum plants were transplanted to a gamma field, and chronically irradiated at from 25 to 150Gy in terms of total dose for 100 days. As the dose was increased, the mutated sectors appeared more frequently on the flowers and petals (Fig. 1). Floral petals and buds with mutated colors dissected from the irradiated plants were cultured in MS media to induce callus, and the regenerated plants were developed to investigate the mutation. Ordinary plants vegetatively propagated from the irradiated plants were also grown as a control.

A wide spectrum of flower color was exhibited on the individual regenerators derived from floral organ cultures (Fig. 2). Wide continuous variations also appeared in types and size of the flowers and leaves on the regenerators from the petal and bud cultures (Fig. 3). No association was observed between mutated

sector color of cultured petals and flower color of the regenerators (Fig. 4).

Frequencies of mutated plants were 39.0, 37.5, and 4.5% in the petal culture, bud culture and ordinary vegetative propagation from the chronically irradiated plants, respectively, and the two former ones were 8 times higher than the latter (Fig. 5). The evidence that no flower color mutant was obtained from the petal culture of the non-irradiated plants suggests mutation was induced rather by chronic irradiation than by culturing.

The present method combined with chronic irradiation and floral organ culturing is excellent for improving conventional mutation breeding on a wide-spreading basis.

(Shigeki NAGATOMI)