テクニカルニュース No. 17
Technical News No. 17

放射線育種場, Institute of Radiation Breeding
昭和51年12月, December 1976

ヒノキ×サワラの交雑不和合性におよぼすガンマー線照射の影響

Effect of gamma irradiation on cross incompatibility between *Chamaecyparis obtusa* S. et Z. and *C. pisifera* S. et Z.

邦産ヒノキ属のヒノキとサワラは生理，生態的特性において大きな差異がみられる。両種ともに我国の重要な林業樹種でヒノキは優れた材質を有するが発根性，耐湿性，ジベレリンによる着花性はサワラに劣る。これらのいずれかの種にそれぞれの優良形質を導入することは理論上可能なことであるが，この二種の交雑稔性は非常に低く雑種育成は困難であるので，これらヒノキとサワラの交雑稔性を高めるためにガンマー線の緩照射を受けたヒノキおよびサワラの花粉を用いて交雑を行った。

この交雑においてガンマー線照射の効果はヒノキ×サワラ(ガンマー線緩照射花粉)の組合せにおいて最も著しく，得られた雑種のほとんどはこの方法によるものであった(表-1)。とくに交配母樹の緩照射では受精後の胚発達への影響が大きく稔実種子は全く得られなかった。

得られた雑種苗は表現型で，ヒノキ型とサワラ型に区別することができ，雑種の中には母樹の他殖による苗木に劣らぬ生長を示すものもあったが，中には葉緑素異常苗，巨大尋常葉苗，矮性苗なども見られた(図-1)。

ヒノキ，サワラともに染色体数は2n＝22でヒノキの第6染色体とサワラの第8染色体は顕微鏡下で，容易に他の染色体と識別ができる。ガンマー線照射によって得られた雑種苗について，体細胞染色体の観察を行った結果，これらの雑種苗は全個体2n＝33の異質倍数体でヒノキの染色体組を1，サワラの染色体組を2有していた(図-2)。これらの異質倍数体の雑種は，ガンマー線照射によってできた非還元花粉が受精にあずかってできたものであると推定されるが，なぜ非還元花粉のみが受精にあずかるかは明らかでない。 (前田武彦)

表-1 ヒノキ×サワラ交雑不和合性におよぼすガンマー線緩照射の効果

Table 1. Effect of chronic gamma irradiation on cross incompatibility between *C. obtusa* and *C. pisifera*

交雑組合 Cross combination	対照区 Control			緩照射区 Chronic gemma irradiated		
	種子数 No. of seeds	発芽数 No. of seedlings	雑種個体数 No. of hybrids	種子数 No. of seeds	発芽数 No. of seedlings	雑種個体数 No. of hybrids
天城1号×サワラ Amagi 1×*C. pisifera*	3073	0	0	5486	9	5
鬼泪4号×サワラ Kinada 4×*C. pisifera*	4000	1	0	7480	9	3
箱根5号×サワラ Hakone 1×*C. pisifera*	879	0	0	1707	5	3
片浦5号×サワラ Kataura 5×*C. pisifera*	2000	0	0	1821	1	1
合計 Total		1	0		24	12

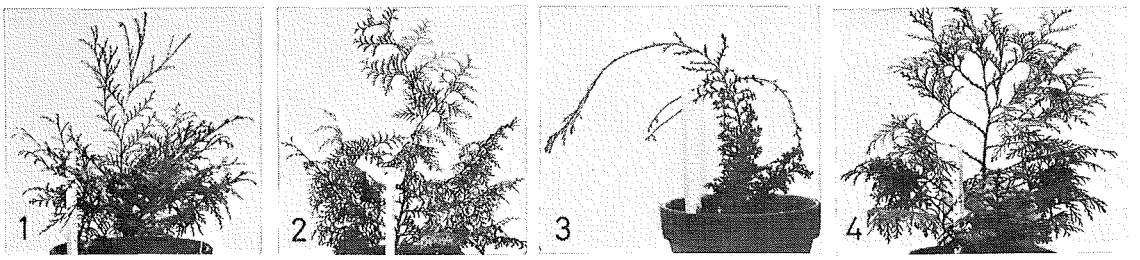

図-1　ヒノキ，サワラおよびヒノキ×サワラ雑種

Fig. 1.　*C. obtusa*, *C. pisifera* and *C. obtusa*×*C. pisifera* hybrids.

1. サワラ　C. pisifera
2. ヒノキ　C. obtusa
3. ヒノキ×サワラ雑種（矮　性）Hybrid of *C. obtusa*×*C. pisifera* (dwarf type)
4. ヒノキ×サワラ雑種（正常型）Hybrid of *C. obtusa*×*C. pisifera* (normal type)

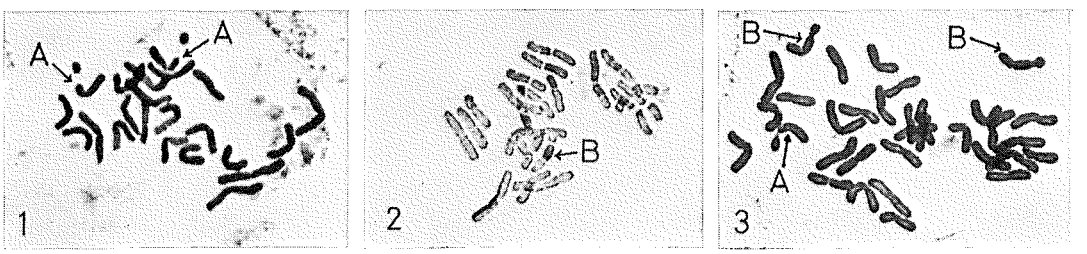

図-2　ヒノキ，サワラおよびヒノキ×サワラ雑種の体細胞染色体

Fig. 2.　Somatic chromosomes of *C. obtusa*, *C. pisifera* and *C. obtusa*×*C. pisifera* hybrids.

1. ヒノキ　Chromosomes of *C. obtusa* (2n=22)
   A：付随体を有する第6染色体
   VI Chromosome with satellite
2. サワラ　Chromosome of *C. pisifesa* (2n=22)
   B：付随体を有する第8染色体
   VIII Chromosome with satellite
3. ヒノキ×サワラ雑種　Chromosomes of *C. obtusa*×*C. pisifera* hybrid (2n=33=3*X*)

Chamaecyparis obtusa and *C. pisifera* are useful forest trees in Japan, although they apparently differ in ecological and physiological characteristics each other. *C. obtusa* has high quality in wood characters, but, is inferior to *C. pisifera* in rooting ability, excess moisture tolerance and flower buds formation by gibberellic acid solution treatment. It is feasible to take each desirable character in one plant by hybridization. It is, however, extremely difficult to obtain hybrids between the two species because of their cross incompatibility. Pollen of *C. obtusa* and *C. pisifera* irradiated chronically in a gamma field were used in the hybridization of the two species. Almost all of the hybrids were obtained only when *C. obtusa* were crossed with pollen of *C. pisifera* which were chronically irradiated and there were no gain of hybrid in the other cross combinations (Table 1). The seedlings so obtained could be classified into two types, the *C. obtusa* type and the *C. pisifera* type by their phenotypes. Although white primary leaved seedlings, gigantic leaved seedlings and dwarf seedlings were found among them (Fig. 1), some of the hybrids had similar growth rate to the seedlings obtained by cross pollination of their mother trees. *C. obtusa* and *C. pisifera* have the same chromosome number 2n=22, and especially, VI chromosome of *C. obtusa* and VIII chromosome of *C. pisifera* can be easily distinguished from other chromosomes in the same genome. When the chromosomes of the hybrids were examined microscopically, all of the hybrids obtained by gamma irradiation had 2n=33 chromosomes including two VIII chromosomes of *C. pisifera* and one VI chromosome of *C. obtusa* (Fig. 2). It was presumed that these allopolyploids with one genome of *C. obtusa* and two genomes of *C. pisifera* were produced by fertilization of the former ovule with unreduced pollen formed by gamma irradiation of the latter. It is, however, not obvious why only the unreduced pollen could take part in fertilization.　(T. Maeta)