Inheritance of Leaf Blotch, Spot and Stripe in Coleus

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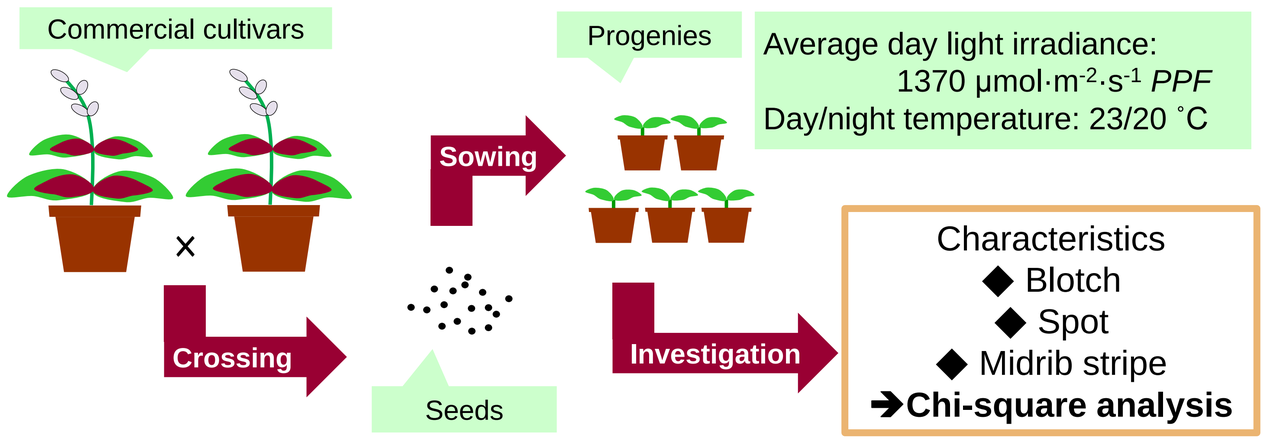
Abstract

Coleus [*Solenostemon scutellariodes* (L.) Codd.], with various leaf variegations and colors, can be used extensively for landscaping and decoration. Crosses between cultivars were conducted to understand leaf blotch, spot and stripe inheritance. Progeny from crossing purple-blotched cultivars resulted in a 1:0 or 3:1 ratio (blotched: non-blotched). Crossing non-blotched individuals produced all non-blotched progeny, and cross blotched cultivars with non-blotched cultivars produced all blotched progenies. These results indicated that purple-blotched characteristic was controlled by a single locus, while blotch (*B*) is dominant to non-blotch (*b*). Selfing scattering spotted cultivars resulted in a 3:1 ratio (spotted: non-spotted) plants. Crossing between non-spot cultivars produced all non-spot plants, and crossing between spot and non-spot cultivar segregated in a 1:1 (spotted: non-spotted) ratio. This suggested that scattering spotted characteristic was controlled by a single locus, while scattering spot (*S*) is dominant to non-spot (*s*). Progeny from crosses between midrib-striped cultivars segregated in a 1:0 or 3:1 ratio (stripe: non-stripe), while those from crossing between non-striped cultivars all produced leaves without any stripe. Progeny of crossing between midrib-striped cultivars and non-striped cultivars resulted in a 1:1 ratio (stripe: non-stripe). These suggested that midrib-striped trait was governed by a single locus, and midrib stripe (*M*) is dominant to non-stripe (*m*).

Introduction

Coleus [*Solenostemon scutellariodes* (L.) Codd.] is valued as important potted and landscape plants notably for their vibrant colorful foliage. Leaf blotches, spot, and stripes have resulted in diverse and intriguing foliar coloration patterns in Coleus. The objective of this study was to understand the mode of inheritance of leaf blotch, spot, and stripe, and to infer the genotype of important Coleus cultivars for leaf coloration pattern.

Materials and Methods



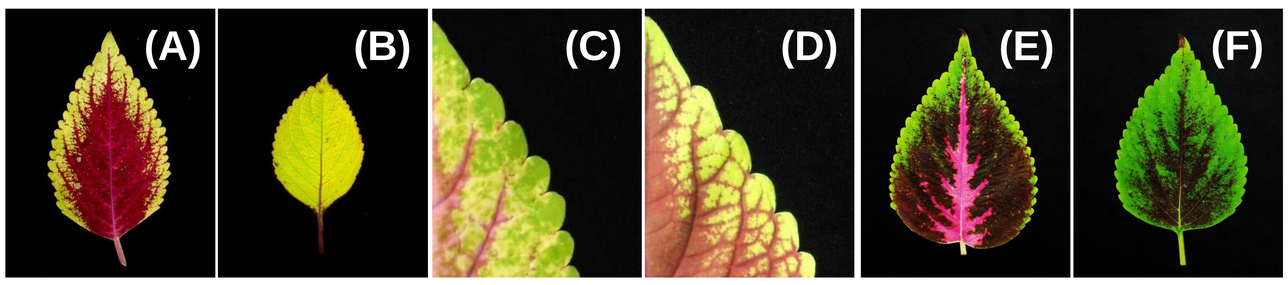


Fig. 1. Typical leaf blotch, spot and stripe characters in coleus progeny. Blotched (A), non-blotched (B), spotted (C), non-spotted (D), striped (E), and non-striped (F)

Results

Blotch

Table 1. Coleus progeny leaf blotch segregation ratios (blotched: non-blotched) for cultivar crosses. *B_* = blotched; *bb* = non-blotched

Crosses (proposed genotype)	Blotch		Total	Expected ratio	χ^2	Probability
	Blotched	Non-blotched				
Cardinal (*Bb*) ⊗	35	11	46	3: 1	0.030	0.862
Carinal S_1-01 (*bb*) ⊗	0	11	11	0: 1	0	1
Carinal S_1-08 (*BB*) ⊗	8	0	8	1: 0	0	1
Defiance (*Bb*) ⊗	21	8	29	3: 1	0.103	0.748
Fiesta (*Bb*) ⊗	20	7	27	3: 1	0.003	0.956
New Hurricane (*Bb*) × Green Cloud (*bb*)	8	9	17	1: 1	0.029	0.864
Norris (*BB*) × Cardinal (*Bb*)	27	0	27	1: 0	0	1
Norris (*BB*) × Carefree (*BB*)	9	0	9	1: 0	0	1
Norris (*BB*) × Wizard Jade (*bb*)	16	0	16	1: 0	0	1
Norris (*BB*) × The Line (*bb*)	6	0	6	1: 0	0	1

- Crosses between blotched cultivars ⇨ segregation ratio = 1: 0 or 3: 1 (blotched: non-blotched)
- Crosses between non-blotched cultivars ⇨ segregation ratio = 0: 1 (blotched: non-blotched)
- Crosses between blotched and non-blotched cultivars ⇨ segregation ratio = 1: 0 or 1: 1 (blotched: non-blotched)

➔Blotch (Fig. 1 A) is dominant to non-blotch (Fig. 1 B)

Spot

Table 2. Coleus progeny leaf spot segregation ratios (spotted: non-spotted) for cultivar crosses. *S_* = spotted; *ss* = non-spotted

Crosses (proposed genotype)	Spot		Total	Expected ratio	χ^2	Probability
	Spotted	Non-spotted				
Cardinal (*ss*) ⊗	0	46	46	0: 1	0	1
Carinal S_1-01 (*ss*) ⊗	0	11	11	0: 1	0	1
Carinal S_1-08 (*ss*) ⊗	0	8	8	0: 1	0	1
Defiance (*ss*) ⊗	0	29	29	0: 1	0	1
Fiesta (*Ss*) ⊗	19	8	27	3: 1	0.308	0.579
Fiesta (*Ss*) × Wizard Jade (*ss*)	22	27	49	1: 1	0.510	0.475
New Hurricane (*ss*) × Green Cloud (*ss*)	0	17	17	0: 1	0	1
Norris (*ss*) × Cardinal (*ss*)	0	27	27	0: 1	0	1
Norris (*ss*) × Carefree (*ss*)	0	9	9	0: 1	0	1
Norris (*ss*) × Wizard Jade (*ss*)	0	16	16	0: 1	0	1
Norris (*ss*) × The Line (*ss*)	0	6	6	0: 1	0	1
Wizard Jade (*ss*) × Fiesta (*Ss*)	7	7	14	1: 1	0	1

- Crosses between spotted cultivars ⇨ segregation ratio = 3: 1 (spotted: non-spotted)
- Crosses between non-spotted cultivars ⇨ segregation ratio = 0: 1 (spotted: non-spotted)
- Crosses between spotted and non-spotted cultivars segregation ratio = 1: 1 (spotted: non-spotted)

➔Spot (Fig. 1 C) is dominant to non-spot (Fig. 1 D)

Midrib-stripe

Table 3. Coleus progeny leaf midrib-stripe segregation ratios (striped: non-striped) for cultivar crosses. *M_* = striped; *mm* = non-striped

Crosses (proposed genotype)	Midrib-stripe		Total	Expected ratio	χ^2	Probability
	Striped	Non-striped				
Cardinal (*mm*) ⊗	0	46	46	0: 1	0	1
Carinal S_1-01 (*mm*) ⊗	0	11	11	0: 1	0	1
Carinal S_1-08 (*mm*) ⊗	0	8	8	0: 1	0	1
Defiance (*mm*) ⊗	0	29	29	0: 1	0	1
Fiesta (*mm*) ⊗	0	27	27	0: 1	0	1
New Hurricane (*mm*) × Green Cloud (*mm*)	0	17	17	0: 1	0	1
Norris (*Mm*) × Cardinal (*mm*)	13	14	27	1: 1	0.037	0.847
Norris (*Mm*) × Carefree (*Mm*)	7	2	9	3: 1	0.037	0.847
Norris (*Mm*) × Jade (*MM*)	16	0	16	1: 0	0	1
Norris (*Mm*) × The Line (*mm*)	3	3	6	1: 1	-	-
Wizard Jade (*MM*) × Fiesta (*mm*)	12	2	14	1: 0	-	-

- Crosses between striped cultivars ⇨ segregation ratio = 3: 1 (striped: non-striped)
- Crosses between non-striped cultivars ⇨ segregation ratio = 0: 1 (striped: non-striped)
- Crosses between striped and non-striped cultivars segregation ratio = 1: 1 (striped: non-striped)

➔Stripe (Fig. 1 E) is dominant to non-stripe (Fig. 1 F)

Conclusions

- Purple blotch is governed by a single gene, and blotched (*B*) is dominant to non-blotched (*b*).
- White spot is governed by a single gene, and spotted (*S*) is dominant to non-spotted (*s*).
- Midrib stripe is governed by a single gene, and striped (*M*) is dominant to non-striped (*m*).