

홍화 도복관련 형질간의 관계분석

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Analysis of relationship between lodging-related traits in safflower

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Objectives

Safflower has been traditionally used for the treatment of blood stasis, and Radix has been used as a drug for fracture in Chinese medicine. In terms of cultivation, spines are known as difficulties during cultivation. Lodging is also a problem to be solved. In this study, an analysis of the relationship between agronomic traits related to lodging was conducted to establish standards for selecting lodging-resistant lines.

Materials and Methods

Ten safflower lines were used. Each line had 40 seedlings in a plot and treated 3times. Plant spacing were 50cm and 30cm respectively(row and cloumn). For each line nine agronomic traits comprised of plant height (PL), stem diameter (SD), no. of branch(NB), no. of flower (NF), total seed weight (TSW), content of component(CC, linolenic acid), breaking weight (BW), lodging index (LI), and moment (MO) were investigated. And the correlation between agronomic traits related to lodging was analyzed. To determine the lodging index, the following items were calculated for each lines according to agricultural research standards. Lodging index : (moment(g·cm) / breaking weight in mid-internode(g)) x 100, moment : plnat length(cm) x fresh weight(g).

Results

For the investigation of lodging-related characteristics, the variation patterns of BW, LI, and Mo in lines were distributed over a wide range of 1638.7~3132.0 for BW, 517.3~1038 for LI, and 1066.6~24695.5 for Mo. content of component(CC, linolenic acid) and total seed weight (TSW) showed positive correlation and plant height (PL) and moment (MO) also had positive correlation.

Fig. 1. Agronomic traits in lines of safflower.

Traits	Plant length (PL, cm)	Stem diameter (SD, mm)	No. of branch (NB)	No. of flower (NF)	Total seed weight (SW, g)	Content of component (mg/g)
CT98	82.5±10.0 ^{abc}	18.6±1.7 ^{ab}	22.8±3.4 ^{abc}	46.2±16.1 ^{ab}	307.3±147.3 ^d	0.45±0.32 ^{bc}
CT238	85.5±3.7 ^{bc}	26.5±2.0 ^{ab}	31.6±4.5 ^{abc}	57.0±11.5 ^a	621.7±73.6 ^{ab}	1.28±0.06 ^a
CT100	89.1±9.8 ^a	19.8±2.4 ^{ab}	20.8±3.6 ^{abc}	39.3±10.5 ^{ab}	764.9±256.1 ^a	0.89±0.49 ^{ab}
CT101	75.9±4.5 ^{bcd}	18.2±1.2 ^{ab}	21.8±3.9 ^{abc}	49.5±8.9 ^{ab}	621.4±198.6 ^{ab}	0.38±0.12 ^{bc}
CT105	85.3±4.9 ^{ab}	20.3±1.8 ^a	24.1±2.7 ^{ab}	47.3±9.2 ^{ab}	418.3±99.2 ^{bcd}	0.87±0.49 ^{ab}
CT139	67.9±6.7 ^{de}	20.2±1.4 ^{ab}	22.1±2.3 ^{abc}	34.8±11.5 ^{ab}	320.7±88.6 ^d	0.34±0.15 ^{bc}
CT185	77.9±7.4 ^{cde}	22.2±1.9 ^{ab}	29.9±2.6 ^a	56.9±10.3 ^{ab}	215.8±17.8 ^d	0.75±0.35 ^{abc}
CT229	82.8±6.0 ^{bcd}	24.2±1.4 ^b	25.9±2.8 ^c	39.1±10.5 ^b	250.8±50.1 ^d	0.38±0.18 ^{bc}
CT233	85.3±3.7 ^{bc}	26.6±1.0 ^{ab}	27.5±2.1 ^{bc}	44.9±9.7 ^{ab}	366.8±54.1 ^{cd}	0.60±0.24 ^{bc}
CT260	86.8±5.8 ^{bc}	27.9±1.5 ^{ab}	32.5±1.7 ^{abc}	53.1±10.8 ^{ab}	569.2±155.0 ^{abc}	0.61±0.40 ^{bc}
외산	69.5±5.1 ^{cde}	11.1±1.5 ^{ab}	13.7±1.8 ^{bc}	24.6±8.7 ^b	646.1±131.7 ^{ab}	0.64±0.34 ^{bc}
두손애	89.1±5.4 ^a	13.9±1.1 ^{ab}	17.3±1.9 ^{abc}	28.1±6.2 ^{ab}	229.6±39.1 ^d	0.19±0.09 ^f
재래	60.4±6.6 ^e	10.9±2.2 ^{ab}	15.2±9.6 ^{abc}	22.5±7.1 ^b	591.0±89.4 ^{abc}	0.81±0.30 ^{ab}

* DMRT, $P < 0.05$

Fig. 2. Variation of agronomic traits related to lodging in lines of safflower.

Traits	Breaking weight (BW, g)	Lodging index (LI)	Moment (Mo)
CT98	2017.3±285.7	1038±347.2	20321.7±4780.7
CT238	1638.7±329.1	780.8±76.0	12632.3±1384.3
CT100	3132.0±761.3	808.3±162.8	24491.3±1069.3
CT101	2188.7±304.6	820.9±92.4	17829.6±1658.3
CT105	2450.0±604.4	720.3±37.3	17654.8±4564.8
CT139	2544.7±1316.9	614.8±292.7	13467.3±2127.8
CT185	2362.7±517.4	517.3±89.2	11942.3±1033.5
CT229	2132.0±231.3	614.0±117.0	13082.5±2863.2
CT233	1950.0±388.4	708.7±113.7	13727.6±2730.6
CT260	2136.7±144.0	651.1±204.4	14090.0±5271.2
외산	1746.7±92.1	611.0±96.5	10665.6±1742.4
두손애	2377.3±184.8	1046.6±151.4	24695.5±1503.9
재래	1691.3±413.0	414.6±32.3	7020.4±1915.7

* DMRT, $P < 0.05$

Fig. 3. Correlation coefficients among six traits.

Traits	PL	TSW	CC	BW	LI	MO
PL	1.00					
TSW	-0.12*	1.00				
CC	0.08*	0.54*	1.00			
BW	0.37*	-0.04*	-0.18*	1.00		
LI	0.63*	-0.12*	-0.29*	0.22*	1.00	
MO	0.68*	-0.05*	-0.28*	0.67*	0.85*	1.00

* : Significant at $P=0.05$

BW : breaking weight in mid-internode, LI : lodging indes, MO : moment