

단순 내부 반복 서열에 의한 홍화 품종의 동정

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Identification of Safflower (*Carthamus tinctorius* L.) with Inter-Simple Sequence Repeat Markers

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Objectives

We have used the inter-simple sequence repeats (ISSR) technique to investigate the phylogenetic relationships and genetic diversity of *Carthamus tinctorius*. The aim of this paper was to determine the compositions of the components of *C. tinctorius* for the first time and to compare it with the composition of *C. tinctorius* from the other countries. This study was carried out to examine 26 cultivars of *C. tinctorius* in order to evaluate genetic diversity and population structure in this species.

Materials and Methods

o Materials

Samples were collected from 149 cultivar populations of *C. tinctorius* of 26 countries including Korea. All seeds of samples were utilized from National Crop Experiment Station (Suwon, Gyonggi Province in Korea). We found that 149 populations of *C. tinctorius* were same lineages or accessions. Thus we selected the representative one cultivar per nation in the world and analyzed 50 seedling plants from each origin.

o Methods

Genomic DNA was isolated from one unexpanded leaf of one plant. ISSR-PCR analysis was performed according to the protocol described by Charters *et al.* (1996). To convert the selected ISSR band to a SCAR (sequence characterized amplified region) marker, the bands excised, cloned and sequenced. The excised PCR bands were separated on 2.0% agarose gels and purified using the QIAquick Gel Extraction Kit. The amplified fragments sequenced using ABI Prism 377 Sequencer.

Results

Mean genetic diversity within cultivars was 0.048. In particular, the Turkey cultivar had the highest expected diversity (0.082); Australia cultivar, the lowest (0.020). Mean

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Shannon's information index (I) was 0.070, ranging from 0.030 to 0.120. The five highest genetic diversities among 26 countries were Turkey, Egypt, India, Kazakhstan, and Sudan. The ISSR-05-04 band is the specific marker for the Kazakhstan cultivar, whereas no products were detected in individuals from other country cultivars. Eight bands (ISSR-03-07, ISSR-05-04, ISSR-08-03, ISSR-09-08, ISSR-09-09, ISSR-11-02, ISSR-11-06, and ISSR-13-01) are specific for one cultivar.

Table 1. Measurements of genetic variation for 26 countries of *C. tinctorius*

Country	Np	Pp	A	AE	H	I	Rank
AFG	14	10.5	1.105	1.068	0.040	0.059	
ARM	11	8.3	1.083	1.067	0.036	0.052	
AUS	7	5.3	1.052	1.034	0.020	0.030	
AZE	21	15.8	1.158	1.103	0.060	0.089	
CAN	12	9.0	1.090	1.062	0.036	0.052	
CHN	13	9.8	1.098	1.058	0.035	0.053	
EGY	24	18.1	1.181	1.129	0.073	0.106	2
ETH	15	11.3	1.113	1.080	0.045	0.066	
HUN	14	10.5	1.105	1.069	0.040	0.059	
IND	23	17.3	1.173	1.125	0.070	0.102	3
IRN	18	13.5	1.135	1.074	0.046	0.071	
KAZ	21	15.8	1.158	1.123	0.067	0.097	4
KOR	11	8.3	1.083	1.063	0.035	0.050	
MAR	19	14.3	1.143	1.089	0.053	0.079	
MEX	7	5.3	1.053	1.030	0.019	0.028	
PAK	21	15.8	1.158	1.103	0.060	0.089	
RUS	10	7.5	1.075	1.060	0.032	0.047	
SDN	21	15.8	1.158	1.123	0.067	0.097	4
SYR	16	12.0	1.120	1.075	0.045	0.067	
TKM	18	13.5	1.135	1.094	0.053	0.078	
THA	8	6.0	1.060	1.034	0.021	0.032	
TJK	20	15.0	1.150	1.100	0.058	0.086	
TUR	27	20.3	1.203	1.146	0.082	0.120	1
UKR	16	12.0	1.120	1.103	0.055	0.077	
USA	10	7.5	1.075	1.052	0.030	0.044	
UZB	22	16.5	1.165	1.106	0.063	0.093	
Total	16.1	12.1	1.124	1.083	0.048	0.070	

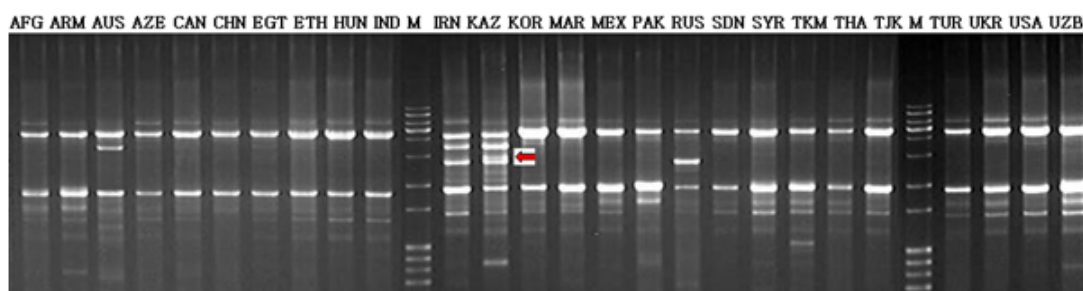


Fig. 1. The specific band of Kazakhstan (KAZ) with the ISSR-05 primer.