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## Determination of Quantity and Purity of Some Geophytes DNA Collected from the Flora of Turkey

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**Abstract:** Turkey is homeland to many species geophyte also some of them are endemic. This study aimed to do comparison of different geophyte species DNA quantity and purity collected from the flora of Turkey. The isolation of pure and high yields of genomic DNA is essential for many molecular biology studies. In addition, one of the objective projects was preservation of endemic species for pure DNA required for the future. Genomic DNA was extracted from *Colchicum*, *Lilium*, *Polygonatum*, *Iris* and *Nectaroscordum* species using modified QIAGEN DNeasy Plant Mini Kit. The purity of isolated genomic DNA was confirmed by spectrophotometric and agarose gel analyses. The results showed that the modified protocol almost successfully produced a sufficient amount of DNA with high quality. *Iris*, *Lilium*, *Polygonatum* and *Nectaroscordum* species of high purity and sufficient amounts of DNA were obtained with the kit. However, from some species of *Colchicum*, sufficient purity and quantity of DNA could not be obtained.

**Key words:** DNA isolation, spectrophotometric analyses, agarose gel, geophytes, Turkey flora

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### INTRODUCTION

Ecology of Turkey is very favorable for geophytes. They have an important place in history of the country. Unfortunately this wealth could not be evaluated fully for many years. Geophytes (bulbs, tubers and rhizomes plants) have a very important place in flora of Turkey. In recent years, a comprehensive projects was generated on geophytes of Turkey. Turkey exports geophytes for horticultural purposes mainly collected from the wild. The amount of material exported from Turkey has increased each year. Several flowering plant families contain species which have underground storage organs such as bulbs, corms and tubers, these plants are used in gardening, cut-flower and flowering pot plant production as geophytes. Geophytes of Turkey are usually used to ornamental properties and very small part of them used for phytochemical content (Sener *et al.*, 1998). The culture and production of corm and bulb plants has been progressed in parallel with the developments in biotechnology research in recent years (Ziv, 1997).

Genetic analyses of plant rely on high yields of pure DNA samples. Some plant species, DNA extraction is difficult because of contents of polyphenols and other secondary metabolites (Aljanabi *et al.*, 1999; Zhang and Stewart, 2000; Dehestani and Tabar, 2007; Sahasrabudhe and Deodhar, 2010; Srivastava *et al.*, 2010; Okpodu and Abdullah-Israel, 2011). All plants have different content

and a single method of DNA isolation is not possible to do for all plants (Vural, 2009). Young leaves and partly opened leaves are preferable during the isolation of DNA. Because young leaves contain lesser amounts of polyphenols and other components which prevents pure DNA synthesis (Shankar *et al.*, 2011).

During the DNA isolation protocols, especially higher quality and yield are two important factors. The DNA isolation protocols include some similar steps. The main purpose is to separate DNA from other compounds especially proteins, carbohydrates, phenols and other polysaccharides. After isolation of DNA it is important to determine purity and yield. Generally gel electrophoresis and spectrophotometer are preferred to determine purity of DNA. The DNA isolated in pure form is used in different molecular studies and different purposes (Channarayappa, 2007; Varma *et al.*, 2007; Tiwari *et al.*, 2012).

Isolation of plant DNA is basic requirement for genome identification, mapping, marker assisted selection and genetic engineering. The degree of purity and quality can vary from plant and isolation protocols. Many different methods and technologies are available for the isolation of genomic DNA. These techniques are based on the selection of different factors. It was asked to be especially high purity of the DNA. It is important for a short time and result in the desired manner. The DNA is usually recovered by precipitation using ethanol or isopropanol (Khan, 2003; Da Silva, 2005).

Many researchers began to use DNA isolation kit for easy application and quick results in recent years (Salem *et al.*, 2006; Al-Saghir, 2009; Mirmomeni *et al.*, 2010). Particularly, these kits are preferred if samples are many and time is limited. The QIAGEN DNeasy Plant Kit, one of which was used successfully in many plant species but the first time in this study were tested over a number of different geophyte genus and species.

In this study, it was tried to isolate pure DNA from *Colchicum*, *Lilium*, *Polygonatum*, *Iris* and *Nectaroscordum* species by using modified QIAGEN DNeasy Plant Mini Kit. Also the purity of isolated genomic DNA was confirmed by spectrophotometric and agarose gel analyses.

## MATERIALS AND METHODS

**Plant materials for DNA isolation:** Turkey flora *Iris*, *Colchicum*, *Lilium*, *Polygonatum* and *Nectasordum* species collected from different locations were used as material in the study. The 322 *Iris*, 252 *Colchicum*, 42 *Polygonatum*, 39 *Lilium* and 3 *Nectaroscordum* types were collected from flora of Turkey. Fresh leaves of these geophytes were used for pure DNA isolation.

**Genomic DNA extraction:** The basic steps of DNA isolation are disruption of the cellular structure to create a lysate, separation of the soluble DNA from cell debris and other insoluble material and purification of the DNA of interest from soluble proteins and other nucleic acids. The majority of DNA isolation systems are based on purification by silica now a days. Regardless of the method used to create a cleared lysate, the DNA of interest can be isolated by virtue of its ability to bind silica in the presence of high concentrations of chaotropic salts (Chen and Thomas Jr., 1980; Marko *et al.*, 1982; Boom *et al.*, 1990). These salts are then removed with an alcohol-based wash and the DNA eluted in a low-ionic-strength solution such as TE buffer or water. The binding of DNA to silica seems to be driven by dehydration and hydrogen bond formation which competes against weak electrostatic repulsion (Melzak *et al.*, 1996). Hence, a high concentration of salt will help to drive DNA adsorption onto silica and a low concentration will release the DNA.

The separation of DNA from cellular components divided into four stages (Fig. 1):

- Disruption
- Lysis
- Removal of proteins and contaminants
- Recovery of DNA

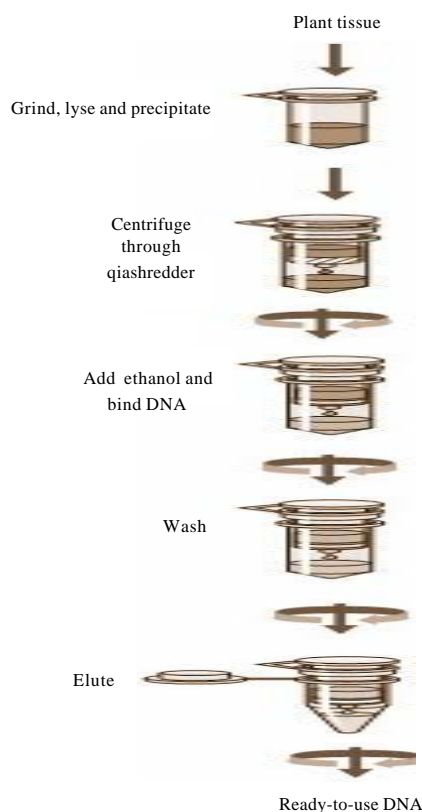


Fig. 1: DNA isolation stages with QIAGEN DNeasy plant kit

**Distruption stage:** The 1 g of fresh leaf was homogenized in a mortar using liquid nitrogen. The 100 mg powdered tissue was transferred to a 2 mL capacity of tubes.

**Lysis stage:** Four hundred microliter Buffer AP1 and 4  $\mu$ L RNase A was added into the mixture. Vortex and incubate for 20 min at 65°C. Invert tube 4-5 times during incubation (do not mix Buffer AP1 and RNase A before use). Add 130  $\mu$ L Buffer AP2. Mix and incubate for 5 min on ice.

**Removal of proteins and contaminants:** Centrifuge the lysate for 5 min at 20,000 $\times$ g (14,000 rpm). Pipet the lysate into a QIAshredder Mini spin column in a 2 mL collection tube. Centrifuge for 2 min at 20,000 $\times$ g (14,000 rpm). Transfer the flow-through fraction into a new tube without disturbing the pellet. Add 1.5 volumes of Buffer AP3/E and mix by pipetting. Transfer 650  $\mu$ L of the mixture into a DNeasy Mini spin column in a 2 mL collection tube. Centrifuge for 1 min at 6000 $\times$ g (8000 rpm). Discard flow-through. Repeat this step with the remaining sample. Place the spin column into a new 2 mL collection tube. Add 500  $\mu$ L Buffer AW and centrifuge for 1 min at 6000 $\times$ g. Discard flow-through. Add another 500  $\mu$ L Buffer

AW. Centrifuge for 2 min at 20,000×g (remove the spin column from the collection tube carefully so, the column does not come into contact with the flow-through).

**Recovery of DNA:** Transfer the spin column to a new 1.5 or 2 mL microcentrifuge tube and add 100 µL Buffer AE for elution. Incubate for 5 min at room temperature. Centrifuge for 1 min at 6000×g.

**Measurement of amount and purity of DNA:** The yield of DNA per gram of leaf tissue extracted was measured using a UV Spectrophotometer (Shimadzu Biospec-mini-Japan) at 260 nm. The purity of DNA was determined by calculating the ratio of absorbance at 260 nm to that of 280 nm (Qiagen Sample and Assay Technologies, 2006) (Table 1-4). DNA concentration and purity was also determined by running the samples on 1% agarose gel (Fig. 2).

## RESULTS AND DISCUSSION

A reasonable amount of clean DNA from most of the geophytes with modified protocol of DNeasy Plant mini kit was yielded. The initial protocol was based on “DNeasy Plant Hand Book” (Qiagen Sample and Assay Technologies, 2006). When tables (Table 1-4) and agarose gel image (Fig. 2) analysed it was clearly seen that especially *Iris* species DNA were isolated in pure form and sufficient amounts. DNA isolation of 322 *Iris*

populations were done successfully. *Iris* population included 40 species and 45 taxon. The highest amounts of DNA were obtained from the *Iris pseudocorus* (population code I 4603) 985 µg µL<sup>-1</sup>. On the other hand the minimum amount of DNA were obtained from the *Iris galactica* (population code I 6804) 2 µg µL<sup>-1</sup>. DNA purity values were as follows, the highest value of 2.80 (*Iris iberica* ssp. *elegantissima* population code I 2,514 population) and the lowest 1.26 (*Iris aucheri* population code I 6202). However, DNA purity of most *Iris* species was in the range 1.7-1.9.

DNA isolation of 250 *Colchicum* populations was done successfully. *Colchicum* population included 36 known *Colchicum* spp. and 10 unknown *Colchicum* spp. The highest amounts of DNA were obtained from the *Colchicum cilicicum* Dammer (population code C 0106) 708 µg µL<sup>-1</sup>. On the other hand the minimum amount of DNA was obtained from the *Colchicum bivonae* (Population code C 1402) 14 µg µL<sup>-1</sup>. DNA purity values were as follows: the highest value of 2.10 from *Colchicum umbrosum* (population code C 3901) and the lowest 1.40 from *Colchicum micaceum* (population code C 0301). However DNA purity of most *Colchicum* species was in the range 1.7-2.0. When agarose gel and spectrophotometric results were examined it was realized that some of *Colchicum* species quantity and purity of DNA was not at the desired levels. While it was isolated sufficient quantities and purity of DNA from majority of *Colchicum* species but in some *Colchicum* species could

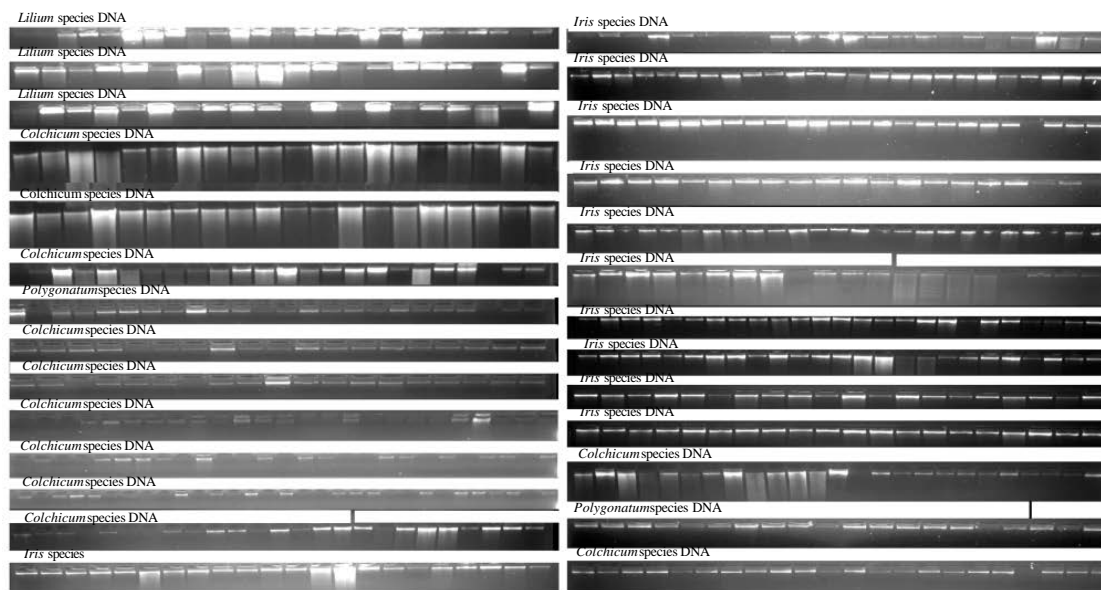


Fig. 2: Electrophoresis of isolated DNA of geophytes on 1% agarose gel

Table 1: DNA purity and amount of different *Iris* species

Tube codes	Population code	Species	Purity of DNA (A260/A280)	Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )	Tube codes	Population code	Species	Purity of DNA (A260/A280)	Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )
286	I 0904	<i>Iris albicans</i>	1.80	253	09-111	I 6514	<i>Iris caucasica</i> subsp <i>caucasica</i>	2.00	50
224	I 3501	<i>Iris albicans</i>	1.90	111	247	I 7501	<i>Iris caucasica</i> subsp <i>caucasica</i>	1.90	130
232	I 3505	<i>Iris albicans</i>	1.90	233	09-129	I 1302	<i>Iris caucasica</i> subsp <i>tureica</i>	1.76	26
282	I 3507	<i>Iris albicans</i>	1.80	267	253	I 2404	<i>Iris caucasica</i> subsp <i>tureica</i>	1.90	244
235	I 3508	<i>Iris albicans</i>	1.90	135	09-139	I 2412	<i>Iris caucasica</i> subsp <i>tureica</i>	1.88	13
240	I 3511	<i>Iris albicans</i>	2.00	171	09-122	I 4901	<i>Iris caucasica</i> subsp <i>tureica</i>	1.99	19
283	I 3512	<i>Iris albicans</i>	1.80	238	09-136	I 5807	<i>Iris ceikii</i>	2.20	11
285	I 4502	<i>Iris albicans</i>	1.80	266	335	I 5104	<i>Iris danfordia</i>	1.80	307
349	I 4804	<i>Iris albicans</i>	2.00	661	Km 255	I 5801	<i>Iris danfordia</i>	1.78	41
09-106	I 4817	<i>Iris albicans</i>	1.88	51	09-109	I 5810	<i>Iris danfordia</i>	1.89	69
367	I 1003	<i>Iris attica</i>	2.00	631	Km 232	I 0501	<i>Iris galatica</i>	2.05	5
337	I 1401	<i>Iris attica</i>	1.90	306	348	I 2401	<i>Iris galatica</i>	2.00	603
215	I 1403	<i>Iris attica</i>	1.90	123	298	I 2406	<i>Iris galatica</i>	1.80	288
377	I 2603	<i>Iris attica</i>	1.80	72	332	I 5101	<i>Iris galatica</i>	1.80	277
408	I 4301	<i>Iris attica</i>	1.70	34	09-119	I 5201	<i>Iris galatica</i>	1.78	12
5	I 2103	<i>Iris aucheri</i>	1.90	396	Km 71	I 5802	<i>Iris galatica</i>	1.86	11
09-131	I 2105	<i>Iris aucheri</i>	1.90	329	Km 248	I 5804	<i>Iris galatica</i>	1.43	12
Km 252	I 3003	<i>Iris aucheri</i>	1.93	25	Km 256	I 5805	<i>Iris galatica</i>	1.61	30
210	I 6202	<i>Iris aucheri</i>	1.26	7	09-123	I 6002	<i>Iris galatica</i>	2.15	7
266	I 4703	<i>Iris bakeriana</i>	1.90	278	256	I 6802	<i>Iris galatica</i>	1.90	333
198	I 4710	<i>Iris bakeriana</i>	1.90	280	Km 233	I 6804	<i>Iris galatica</i>	2.00	2
Km 64	I 6507	<i>Iris barnuniae</i> f. <i>barnuniae</i>	1.90	219	221	I 2104	<i>Iris gatesii</i>	1.90	108
Km 36	I 6508	<i>Iris barnuniae</i> f. <i>barnuniae</i>	1.57	3	09-130	I 2106	<i>Iris gatesii</i>	1.70	32
312	I 6505	<i>Iris barnuniae</i> f. <i>urumiensis</i>	1.60	24	10	I 4702	<i>Iris gatesii</i>	1.90	346
Km 33	I 6505/a	<i>Iris barnuniae</i> f. <i>urumiensis</i>	1.60	39	187	I 6303	<i>Iris gatesii</i>	2.00	280
09-113	I 6501	<i>Iris caucasica</i>	1.53	8	236	I 0203	<i>Iris germanica</i>	1.90	158
Km 239	I 6510	<i>Iris caucasica</i>	2.00	16	357	I 1601	<i>Iris germanica</i>	2.00	665
09-133	I 6001	<i>Iris caucasica</i> subsp <i>caucasica</i>	1.77	73	390	I 2708	<i>Iris germanica</i>	1.90	96
257	I 2502	<i>Iris caucasica</i> subsp <i>caucasica</i>	1.83	19	229	I 3102	<i>Iris germanica</i>	1.90	137
248	I 2507	<i>Iris caucasica</i> subsp <i>caucasica</i>	1.90	350	237	I 3103	<i>Iris germanica</i>	2.00	131
258	I 2510	<i>Iris caucasica</i> subsp <i>caucasica</i>	1.90	143	281	I 3504	<i>Iris germanica</i>	1.80	256
09-115	I 2902	<i>Iris caucasica</i> subsp <i>caucasica</i>	1.90	278	280	I 3506	<i>Iris germanica</i>	1.80	315
296	I 4101	<i>Iris germanica</i>	2.12	10	234	I 3509	<i>Iris germanica</i>	2.00	130
336	I 4605	<i>Iris germanica</i>	1.90	300	252	I 1402	<i>Iris kerneriana</i>	1.90	241
387	I 4705	<i>Iris germanica</i>	1.80	296	425	I 1603	<i>Iris kerneriana</i>	1.60	72
214	I 4707	<i>Iris germanica</i>	1.80	59	370	I 1801	<i>Iris kerneriana</i>	2.00	603
211	I 4802	<i>Iris germanica</i>	1.60	59	244	I 2601	<i>Iris kerneriana</i>	2.00	187
09-118	I 5701	<i>Iris germanica</i>	1.90	143	381	I 2605	<i>Iris kerneriana</i>	2.00	568
293	I 7006	<i>Iris germanica</i>	2.03	13	342	I 2901	<i>Iris kerneriana</i>	1.80	292
374	I 7008	<i>Iris germanica</i>	1.90	264	383	I 3702	<i>Iris kerneriana</i>	1.60	75
226	I 7701	<i>Iris germanica</i>	2.00	644	368	I 3703	<i>Iris kerneriana</i>	2.00	564
328	I 7702	<i>Iris germanica</i>	2.00	111	223	I 3106	<i>Iris kirikwoodii</i>	1.90	107
265	I 6102	<i>Iris germanica</i> ( <i>bicolor</i> )	1.80	311	22	I 4602	<i>Iris kirikwoodii</i>	1.90	308
397	I 4704	<i>Iris germanica</i> ( <i>mezopotamica</i> )	1.90	294	Km 45	I 2801	<i>Iris lazica</i>	1.75	11
317	I 1606	<i>Iris germanica</i> ( <i>yellow flower</i> )	1.70	86	Km 63	I 2802	<i>Iris lazica</i>	2.01	44
310	I 2702	<i>Iris histrio</i>	1.80	288	192	I 5302	<i>Iris lazica</i>	2.00	335
			1.80	267	203	I 5303	<i>Iris lazica</i>	1.90	182

Table 1: Continue

Tube codes	Population code	Species	Purity of DNA (A260/A280)	Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )	Tube codes	Population code	Species	Purity of DNA (A260/A280)	Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )
3	I 2703	<i>Iris histrio</i>	1.80	437	09-126	I 0715/b	<i>Iris masia</i>	2.19	20
195	I 3107	<i>Iris histrio</i>	1.70	219	Km 237	I 2712	<i>Iris masia</i>	1.48	22
184	I 3304	<i>Iris histrio</i>	1.80	352	196	I 6302	<i>Iris masia</i>	1.80	43
207	I 2704	<i>Iris histrio</i> var. <i>aintabensis</i>	1.90	170	394	I 4706/1	<i>Iris nectarifera</i> var. <i>maradnensis</i>	1.80	74
09-116	I 0502	<i>Iris histrioides</i>	1.99	18	14	I 4706/2	<i>Iris nectarifera</i> var. <i>maradnensis</i>	1.90	308
09-103	I 0504	<i>Iris histrioides</i>	1.77	55	09-108	I 4711	<i>Iris nectarifera</i> var. <i>nectarifera</i>	1.94	42
246	I 5304	<i>Iris histrioides</i>	1.60	90	264	I 0802	<i>Iris nezahatiae</i>	2.00	303
Km 52	I 2513	<i>Iris Yberica</i> subsp. <i>elegantissima</i>	1.83	39	09-117	I 0804	<i>Iris nezahatiae</i>	1.91	18
Km 60	I 2514	<i>Iris Yberica</i> subsp. <i>elegantissima</i>	2.80	10	209	I 0701	<i>Iris orientalis</i>	1.90	174
378	I 3602	<i>Iris Yberica</i> subsp. <i>elegantissima</i>	2.00	623	338	I 0705	<i>Iris orientalis</i>	1.80	269
Km 55	I 6516	<i>Iris Yberica</i> subsp. <i>elegantissima</i>	1.50	16	426	I 0710	<i>Iris orientalis</i>	1.70	100
Km 58	I 3001	<i>Iris Yberica</i> subsp. <i>lycois</i>	2.06	17	409	I 0714	<i>Iris orientalis</i>	1.90	29
Km 68	I 3002	<i>Iris Yberica</i> subsp. <i>lycois</i>	2.06	5	347	I 0901	<i>Iris orientalis</i>	2.00	652
287	I 0101	<i>Iris junonia</i>	1.80	228	201	I 1001	<i>Iris orientalis</i>	1.90	216
231	I 0103	<i>Iris junonia</i>	2.00	229	417	I 1501	<i>Iris orientalis</i>	1.50	927
Km 65	I 0108	<i>Iris junonia</i>	1.96	16	197	I 2001	<i>Iris orientalis</i>	1.90	226
09-128	I 0503	<i>Iris kerneriana</i>	1.88	15	205	I 2604	<i>Iris orientalis</i>	1.90	197
09-110	I 0505	<i>Iris kerneriana</i>	1.90	67	339	I 3510	<i>Iris orientalis</i>	1.90	346
273	I 0601	<i>Iris kerneriana</i>	1.90	240	190	I 3513	<i>Iris orientalis</i>	2.00	316
272	I 0605	<i>Iris kerneriana</i>	1.90	301	Km 53	I 6003	<i>Iris orientalis</i>	1.68	24
423	I 6403	<i>Iris orientalis</i>	1.80	108	09-127	I 6505/b	<i>Iris pseudocaucasica</i>	1.84	16
406	I 0706	<i>Iris pamphylica</i>	1.80	107	Km 242	I 6506	<i>Iris pseudocaucasica</i>	1.39	16
204	I 0707	<i>Iris pamphylica</i>	1.80	317	330	I 0803	<i>Iris pseudococcus</i>	1.90	288
307	I 0717	<i>Iris pamphylica</i>	1.80	288	309	I 1002	<i>Iris pseudococcus</i>	1.80	266
Km 42	I 6502	<i>Iris paradoxo</i>	1.68	27	385	I 2204	<i>Iris pseudococcus</i>	1.45	45
Km 70	I 6512	<i>Iris paradoxo</i>	2.02	5	279	I 2602	<i>Iris pseudococcus</i>	1.80	236
395	I 0102	<i>Iris persica</i>	1.90	76	424	I 2711	<i>Iris pseudococcus</i>	1.50	80
301	I 0105	<i>Iris persica</i>	1.80	311	3108	I 3108	<i>Iris pseudococcus</i>	1.90	134
386	I 0106	<i>Iris persica</i>	1.80	58	389	I 3201	<i>Iris pseudococcus</i>	1.80	53
9	I 0201-3	<i>Iris persica</i>	1.90	335	288	I 3202	<i>Iris pseudococcus</i>	1.80	283
09-105	I 0607	<i>Iris persica</i>	1.91	56	297	I 3405	<i>Iris pseudococcus</i>	1.80	251
Km 231	I 1301	<i>Iris persica</i>	1.91	13	322	I 4207	<i>Iris pseudococcus</i>	1.80	259
206	I 2101	<i>Iris persica</i>	2.00	134	418	I 4603	<i>Iris pseudococcus</i>	1.50	985
Km 240	I 2301	<i>Iris persica</i>	1.49	15	295	I 4803	<i>Iris pseudococcus</i>	1.80	238
271	I 2402	<i>Iris persica</i>	1.90	307	320	I 5301	<i>Iris pseudococcus</i>	1.80	292
276	I 2403/c	<i>Iris persica</i>	1.80	296	249	I 5402	<i>Iris pseudococcus</i>	2.00	255
304	I 2405	<i>Iris persica</i>	1.80	270	Km 37	I 5501	<i>Iris pseudococcus</i>	1.65	18
Km 247	I 4401	<i>Iris persica</i>	1.33	13	416	I 6301	<i>Iris pseudococcus</i>	1.60	57
Km 250	I 4402	<i>Iris persica</i>	1.84	21	393	I 6701	<i>Iris pseudococcus</i>	1.80	79
Km 246	I 4403	<i>Iris persica</i>	1.29	12	250	I 7401	<i>Iris pseudococcus</i>	2.00	231
Km 249	I 4405	<i>Iris persica</i>	1.61	10	238	I 0704	<i>Iris purpureabractea</i>	1.90	193
Km 244	I 4408	<i>Iris persica</i>	1.54	8	350	I 0711	<i>Iris purpureabractea</i>	2.00	693
09-107	I 4409	<i>Iris persica</i>	1.82	62	398	I 0713	<i>Iris purpureabractea</i>	2.00	92
364	I 4601	<i>Iris persica</i>	2.00	633	413	I 1502	<i>Iris purpureabractea</i>	1.70	56
396	I 4606	<i>Iris persica</i>	2.00	79	227	I 1604-1	<i>Iris purpureabractea</i>	1.90	111
268	I 4607	<i>Iris persica</i>	1.90	258	239	I 1604-2	<i>Iris purpureabractea</i>	1.80	176
375	I 4709	<i>Iris persica</i>	2.00	632	233	I 1604-3	<i>Iris purpureabractea</i>	1.90	164

Table 1: Continue

Tube codes	Population code	Species	Purity of DNA (A260/A280)	Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )	Tube codes	Population code	Species	Purity of DNA (A260/A280)	Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )
09-112	I 4712	<i>Iris persica</i>	1.86	62	220	I 1604-4	<i>Iris purpureobracteata</i>	1.80	124
351	I 5103	<i>Iris persica</i>	1.90	640	216	I 2002	<i>Iris purpureobracteata</i>	2.00	87
Km 251	I 5809	<i>Iris persica</i>	1.37	15	415	I 6401	<i>Iris purpureobracteata</i>	1.60	84
09-104	I 6203	<i>Iris persica</i>	1.86	86	373	I 7001	<i>Iris purpureobracteata</i>	2.00	644
260	I 8001	<i>Iris persica</i>	2.00	277	267	I 2403/a	<i>Iris reticulata</i>	2.00	205
Km 241	I 4406	<i>Iris pseudocaucasica</i>	1.45	13	300	I 2403/b	<i>Iris reticulata</i>	1.80	273
Km 245	I 6503	<i>Iris pseudocaucasica</i>	1.76	76	Km 238	I 2411	<i>Iris reticulata</i>	1.53	14
Km 243	I 4407	<i>Iris reticulata</i>	1.40	12	334	I 7503	<i>Iris sibirica</i>	1.80	277
09-135	I 6201	<i>Iris reticulata</i>	1.73	26	188	I 1404	<i>Iris sinensis</i>	2.00	316
311	I 6304	<i>Iris reticulata</i>	1.80	255	422	I 1405	<i>Iris sinensis</i>	1.60	65
Km 236	I 6511	<i>Iris reticulata</i>	1.98	12	186	I 1406	<i>Iris sinensis</i>	1.90	385
331	10202/1-2-4	<i>Iris sari</i>	1.80	267	251	I 2202	<i>Iris sinensis</i>	1.90	321
363	I 0204	<i>Iris sari</i>	2.00	461	193	I 3402	<i>Iris sinensis</i>	1.90	320
316	I 0602	<i>Iris sari</i>	1.80	287	262	I 3403	<i>Iris sinensis</i>	2.00	236
369	I 0604	<i>Iris sari</i>	2.00	663	200	I 3404	<i>Iris sinensis</i>	1.90	232
277	I 0606	<i>Iris sari</i>	1.80	329	376	I 3406	<i>Iris sinensis</i>	2.00	587
09-125	I 0608	<i>Iris sari</i>	1.93	20	275	I 3410	<i>Iris sinensis</i>	1.90	266
421	I 1802	<i>Iris sari</i>	1.70	79	Km 51	I 3411	<i>Iris sinensis</i>	1.73	33
365	I 2409	<i>Iris sari</i>	2.00	375	319	I 3701	<i>Iris sinensis</i>	1.80	288
Km 46	I 2410	<i>Iris sari</i>	1.67	22	274	I 3901	<i>Iris sinensis</i>	1.90	234
410	I 2701	<i>Iris sari</i>	1.70	45	269	I 3903	<i>Iris sinensis</i>	1.80	242
212	I 2705	<i>Iris sari</i>	2.00	123	382	I 5901	<i>Iris sinensis</i>	1.50	136
419	I 2706	<i>Iris sari</i>	1.60	61	355	I 7802	<i>Iris sinensis</i>	2.00	602
359	I 2707	<i>Iris sari</i>	1.62	402	194	<i>Iris sprengeri</i>	<i>Iris sprengeri</i>	1.80	148
Km 50	I 4404	<i>Iris sari</i>	1.80	27	Km 47	<i>Iris sprengeri</i>	<i>Iris sprengeri</i>	1.96	16
302	I 4608	<i>Iris sari</i>	1.77	265	09-137	<i>Iris spuria</i> subsp. <i>musulmanica</i>	<i>Iris spuria</i> subsp. <i>musulmanica</i>	1.61	29
Km 57	I 6513	<i>Iris sari</i>	1.80	34	380	<i>Iris spuria</i> subsp. <i>musulmanica</i>	<i>Iris spuria</i> subsp. <i>musulmanica</i>	1.60	85
Km 44	I 6515	<i>Iris sari</i>	1.89	316	361	<i>Iris spuria</i> subsp. <i>musulmanica</i>	<i>Iris spuria</i> subsp. <i>musulmanica</i>	2.00	615
306	I 6801	<i>Iris sari</i>	1.80	316	329	<i>Iris spuria</i> subsp. <i>musulmanica</i>	<i>Iris spuria</i> subsp. <i>musulmanica</i>	1.90	292
324	I 0301	<i>Iris schachtii</i>	1.90	346	Km 69	<i>Iris spuria</i> subsp. <i>musulmanica</i>	<i>Iris spuria</i> subsp. <i>musulmanica</i>	2.04	687
341	I 0302	<i>Iris schachtii</i>	1.90	691	Km 41	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	1.79	64
354	I 0603	<i>Iris schachtii</i>	1.90	307	325	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	1.80	259
259	I 1804	<i>Iris schachtii</i>	1.90	364	405	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	1.60	87
8	I 4201	<i>Iris schachtii</i>	1.80	260	242	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	2.00	314
299	I 4202	<i>Iris schachtii</i>	1.60	90	400	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	1.60	267
399	I 4203	<i>Iris schachtii</i>	2.00	643	360	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	2.00	363
384	I 4205	<i>Iris schachtii</i>	1.82	28	318	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	1.80	314
09-138	I 5803	<i>Iris schachtii</i>	1.80	21	321	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	1.90	314
Km 40	I 5806	<i>Iris schachtii</i>	1.88	63	371	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	2.00	701
Km 62	I 5808	<i>Iris schachtii</i>	2.00	186	270	<i>Iris stenophylla</i> subsp. <i>allisonii</i>	<i>Iris stenophylla</i> subsp. <i>allisonii</i>	1.90	316
245	I 3601	<i>Iris sibirica</i>	1.80	318	261	<i>Iris taochia</i>	<i>Iris taochia</i>	2.00	233
327	I 7003	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	1.80	343	379	<i>Iris taochia</i>	<i>Iris taochia</i>	2.00	604
303	I 7004	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	1.80	286	254	<i>Iris taochia</i>	<i>Iris taochia</i>	1.90	208
294	I 7005	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	1.80	296	402	<i>Iris taochia</i>	<i>Iris taochia</i>	1.60	53
292	I 7007	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	1.80	332	411	<i>Iris taochia</i>	<i>Iris taochia</i>	1.70	36
255	I 7009	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	1.90	261	305	<i>Iris taochia</i>	<i>Iris taochia</i>	1.80	291
263	I 7010	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	2.00						

Table 1: Continue

Tube codes	Population code	Species	Purity of DNA (A260/A280)	Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )	Tube codes	Population code	Species	Purity of DNA (A260/A280)	Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )
241	I 7011	<i>Iris stenophylla</i> ssp. <i>stenophylla</i>	1.80	100	326	I 2508	<i>Iris taochia</i>	1.80	302
315	I 1602	<i>Iris suaveolens</i>	1.90	306	191	I 0703	<i>Iris unguicularis</i>	1.90	361
213	I 1701	<i>Iris suaveolens</i>	1.90	115	388	I 0708	<i>Iris unguicularis</i>	1.60	38
314	I 1803	<i>Iris suaveolens</i>	1.90	327	401	I 0709	<i>Iris unguicularis</i>	1.70	73
278	I 2201	<i>Iris suaveolens</i>	1.80	352	346	I 0712	<i>Iris unguicularis</i>	2.00	647
353	I 2203	<i>Iris suaveolens</i>	2.00	631	Km 43	I 0716	<i>Iris unguicularis</i>	1.83	71
362	I 3401	<i>Iris suaveolens</i>	2.00	621	Km 35	I 0718	<i>Iris unguicularis</i>	1.80	54
333	I 3407	<i>Iris suaveolens</i>	1.80	273	I 3101	<i>Iris unguicularis</i>	2.00	162	
366	I 3408	<i>Iris suaveolens</i>	2.00	610	I 3104	<i>Iris unguicularis</i>	2.00	109	
313	I 3409	<i>Iris suaveolens</i>	1.80	241	I 3109	<i>Iris unguicularis</i>	1.70	106	
218	I 3902	<i>Iris suaveolens</i>	1.90	126	I 4801	<i>Iris unguicularis</i>	1.90	335	
1	I 4102	<i>Iris suaveolens</i>	2.00	237	I 4810	<i>Iris unguicularis</i>	1.76	27	
412	I 4501	<i>Iris suaveolens</i>	1.70	43	I 4812/1	<i>Iris unguicularis</i>	1.87	27	
09-114	I 5502	<i>Iris suaveolens</i>	1.83	20	I 4812/2	<i>Iris unguicularis</i>	1.87	51	
414	I 6402	<i>Iris suaveolens</i>	1.70	51	09-134	<i>Iris xanthospuria</i>	1.80	286	
09-120	I 7703	<i>Iris suaveolens</i>	2.01	18	290	<i>Iris xanthospuria</i>	1.90	39	
308	I 7801	<i>Iris suaveolens</i>	1.80	299	Km 56	<i>Iris xanthospuria</i>	2.00	23	
289	I 0801	<i>Iris taochia</i>	1.80	252	344	<i>Iris xanthospuria</i>	2.00	654	
372	I 2501	<i>Iris taochia</i>	2.00	579	Km 49	<i>Iris xanthospuria</i>	1.81	50	



Table 2: DNA purity and amount of different *Colchicum* species

Tube Codes	Population code	Species	Purity of DNA (A260/A280)	Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )	Tube codes	Population code	Species	Purity of DNA (A260/A280)	Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )
2	C 0801	<i>Colchicum speciosum</i>	1.80	61	55	C 3503	<i>Colchicum boissieri</i>	2.00	351
7	C 6101	<i>Colchicum speciosum</i>	1.90	300	56	C 4303	<i>Colchicum szovitsii</i>	2.00	371
27	C 6901	<i>Colchicum speciosum</i>	1.90	309	57	C 1505	<i>Colchicum sangaicolle</i>	2.00	122
28	C 5301	<i>Colchicum speciosum</i>	1.90	347	58	C 3310	<i>Colchicum imperatoris-friderici</i>	2.00	355
30	C 2603	<i>Colchicum atticum</i>	1.90	315	59	C 1406	<i>Colchicum atticum</i>	2.00	386
31	C 2604	<i>Colchicum atticum</i>	1.90	273	60	C 7007	Unknown species and nova	2.00	394
32	C 4805	<i>Colchicum balansae</i>	1.90	312	61	C 7001	<i>Colchicumsepernitinum</i>	2.00	380
36	C 7701	<i>Colchicum chalcidonicum</i>	1.90	266	62	C 7008	<i>Colchicum balansae</i>	2.00	402
37	C 1410	<i>Colchicum bivonae</i>	1.80	81	63	C 7009	<i>Colchicum serpentinum</i>	2.00	372
39	C 1503	<i>Colchicum soboliferum</i>	1.80	195	64	C 4202	<i>Colchicum serpentinum</i>	2.00	261
40	C 4205	<i>Colchicum balansae</i>	1.90	272	65	C 4214	<i>Colchicum variegatum</i>	1.90	271
41	C 2001	<i>Colchicum burtii</i>	1.80	184	66	C 4209/b	<i>Colchicum serpentinum</i>	2.00	378
42	C 4201	<i>Colchicum triphyllum</i>	1.90	289	67	C 4209/a	<i>Colchicum triphyllum</i>	2.00	400
43	C 4806	<i>Colchicum chalde subsp. punctatum</i>	1.70	124	68	C 4305	<i>Colchicum atticum</i>	2.00	391
44	C 1504	<i>Colchicum serpentinum</i>	1.90	339	69	C 4210	<i>Colchicum variegatum</i>	2.00	386
45	C 4803	<i>Colchicum balansae</i>	1.90	337	70	C 1502/b	<i>Colchicum variegatum</i>	2.00	395
46	C 1502/a	<i>Colchicum boytopiorum</i>	1.90	287	71	C 2002	<i>Colchicum burtii</i>	2.00	381
47	C 4217	Unknown species and nova.	1.90	295	72	C 4207	<i>Colchicum variegatum</i>	2.00	350
48	C 4213	<i>Colchicum inundatum</i>	1.90	305	73	C 4802	<i>Colchicum variegatum</i>	2.00	364
49	C 0717	<i>Colchicum sangaicolle</i>	1.90	187	74	C 4804	<i>Colchicum linguatatum ssp. virgescens</i>	2.00	381
50	C 4208	Unknown species and nova	1.90	167	75	C 3505	<i>Colchicum variegatum</i>	2.00	114
51	C 4211/b	Unknown species and nova	2.00	166	76	C 7002	<i>Colchicum serpentinum</i>	1.90	72
52	C 4211/a	<i>Colchicum triphyllum</i>	2.00	371	79	C 2605	<i>Colchicum leptanthum</i>	1.70	75
53	C 0901	<i>Colchicum chalde subsp. punctatum</i>	2.00	406	80	C 6202	<i>Colchicum bivonae</i>	1.70	64
54	C 6401	<i>Colchicum triphyllum</i>	2.00	368	81	C 6302	<i>Colchicum persicum</i>	2.00	289
82	C 4607	<i>Colchicum triphyllum</i>	1.90	43	119	C 4603	<i>Colchicum polyphyllum</i>	2.00	255
83	C 1501	<i>Colchicum variegatum</i>	1.80	35	120	C 5102	<i>Colchicum serpentinum</i>	2.00	257
84	C 3203	<i>Colchicum variegatum</i>	2.00	292	121	C 6103	<i>Colchicum speciosum</i>	1.90	236
85	C 1402	<i>Colchicum bivonae</i>	1.80	14	122	C 3402	<i>Colchicum ciliatum</i>	2.00	274
86	C 4604	<i>Colchicum sz. ssp. brancchyphyllum</i>	1.60	41	123	C 0803	<i>Colchicum umbrosum</i>	2.00	274
87	C 0902	<i>Colchicum variegatum</i>	1.70	32	124	C 3106	<i>Colchicum szovitsii</i>	2.00	311
88	C 3401	<i>Colchicum bivonae</i>	2.00	373	125	C 3506	<i>Colchicum turcicum</i>	2.00	269
89	C 4608	<i>Colchicum kotschy</i>	2.00	379	126	C 2201	<i>Colchicum turcicum</i>	1.90	290
90	C 6304	<i>Colchicum persicum</i>	1.70	50	127	C 6301	<i>Colchicum sz. ssp. brancchyphyllum</i>	2.00	305
91	C 3107	<i>Colchicum decaisnei</i>	1.80	34	128	C 6303	<i>Colchicum kotschy</i>	1.90	38
92	C 4801	<i>Colchicum burtii</i>	2.00	371	129	C 0804	<i>Colchicum umbrosum</i>	2.00	245
93	C 0806	<i>Colchicum speciosum</i>	1.90	22	130	C 5306	<i>Colchicum speciosum</i>	2.00	296
94	C 2902	<i>Colchicum speciosum</i>	2.00	401	131	C 1701	<i>Colchicum bivonae</i>	2.00	254
95	C 4701	<i>Colchicum crocifolium</i>	2.00	397	132	C 5103	<i>Colchicum ciliatum</i>	2.00	247
96	C 0704/b	<i>Colchicum balansae</i>	1.80	229	133	C 0805	<i>Colchicum umbrosum</i>	1.90	79
99	C 0802	<i>Colchicum speciosum</i>	2.00	305	134	C 0716	<i>Colchicum stewartii</i>	2.00	313
103	C 2003	<i>Colchicum burtii</i>	2.00	247	135	C 3105	Unknown species and nova	2.00	256
104	C 2401	<i>Colchicum serpentinum</i>	2.00	242	136	C 0102	<i>Colchicum ciliatum</i>	2.00	285
105	C 7901	<i>Colchicum polyphyllum</i>	1.70	34	137	C 5902	<i>Colchicum bivonae</i>	2.00	256
106	C 3403	<i>Colchicum chalcidonicum</i>	1.70	45	138	C 2703	<i>Colchicum devisii</i>	1.90	85
107	C 8011	<i>Colchicum polyphyllum</i>	1.50	35	139	C 5901	<i>Colchicum turcicum</i>	2.00	271
108	C 8005	<i>Colchicum ciliatum</i>	1.90	88	140	C 3701	<i>Colchicum speciosum</i>	1.90	97

Table 2: Continue

Tube codes	Population code	Species	Purity of DNA		Tube codes	Population code	Species	Purity of DNA		Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )
			(A260/A280)	(A260/A280)				(A260/A280)	(A260/A280)	
109	C 4601	<i>Colchicum serpentinum</i>	1.90	2.00	141	C 0103	<i>Colchicum ciliatum</i>	1.90	2.00	266
110	C 8004	<i>Colchicum polyphyllum</i>	2.00	2.55	142	C 6102	<i>Colchicum spectiosum</i>	2.00	1.80	292
111	C 5302	<i>Colchicum spectiosum</i>	2.00	2.97	143	C 3405	<i>Colchicum micranthum</i>	2.00	2.00	39
112	C 8007	<i>Colchicum devissii</i>	2.00	3.13	144	C 3404	<i>Colchicum micranthum</i>	2.00	2.00	247
113	C 7010	<i>Colchicum serpentinum</i>	2.00	2.71	145	C 6301	<i>Colchicum sz. ssp. brachyphyllum</i>	2.00	2.00	263
114	C 8002	<i>Colchicum polyphyllum</i>	1.70	4.2	146	C 7004	<i>Colchicum triphyllum</i>	2.00	2.00	296
115	C 4304	<i>Colchicum burttii</i>	2.00	2.74	147	C 3104	<i>Colchicum decaysnei</i>	1.90	1.90	81
116	C 4212	<i>Colchicum variegatum</i>	1.90	3.74	148	C 3309	<i>Colchicum dolichanthemum</i>	1.90	2.00	279
117	C 0701/a	<i>Colchicum variegatum</i>	2.00	2.62	149	C 3101	<i>Colchicum decaysnei</i>	2.00	2.00	250
118	C 7501	<i>Colchicum speciosum</i>	2.00	2.50	150	C 0711	<i>Colchicum decaysnei</i>	2.00	2.00	269
151	C 4703	<i>Colchicum serpentinum</i>	2.00	2.77	444	C 0605	<i>Colchicum bivonae</i>	1.90	1.90	544
152	C 0106	<i>Colchicum ciliatum</i>	1.80	7.08	445	C 2607	<i>Colchicum triphyllum</i>	1.90	1.90	606
153	C 2904	<i>Colchicum speciosum</i>	2.00	2.66	446	C 1416	<i>Colchicum spectiosum</i>	1.90	1.90	633
154	C 3103	Unknown species and nova	1.90	2.43	447	C 4203	<i>Colchicum triphyllum</i>	1.90	1.90	605
155	C 3303	<i>Colchicum ciliatum</i>	2.00	2.44	448	C 3504	<i>Colchicum micaceum</i>	1.90	1.90	610
156	C 2702	<i>Colchicum persicum</i>	2.00	2.57	449	C 4204	<i>Colchicum heldeichii</i>	1.90	1.90	484
157	C 3202	<i>Colchicum kotschyi</i> (different)	2.00	2.33	450	C 1401	<i>Colchicum triphyllum</i>	1.90	1.90	553
158	C 3204	<i>Colchicum kotschyi</i> (different)	1.80	7.5	451	C 4302	<i>Colchicum burttii</i>	1.60	1.60	457
159	C 7502	<i>Colchicum speciosum</i>	2.00	2.64	452	C 1413	<i>Colchicum spectiosum</i>	1.90	1.90	603
160	C 8003	<i>Colchicum dolichanthemum</i>	2.00	2.71	453	C 0702	<i>Colchicum minutum</i>	1.90	1.90	532
161	C 2101	<i>Colchicum crocifolium</i>	2.00	2.58	454	C 4502	<i>Colchicum boissieri</i>	1.90	1.90	590
162	C 0703	<i>Colchicum decaysnei</i>	2.00	6.0	455	C 1411	<i>Colchicum bivonae</i>	1.80	1.80	638
163	C 0709	<i>Colchicum variegatum</i>	2.00	2.67	456	C 1404	<i>Colchicum bivonae</i>	1.70	1.62	162
164	C 4605	<i>Colchicum polyphyllum</i>	2.00	2.45	457	C 0714	<i>Colchicum triphyllum</i>	1.90	1.90	569
165	C 3901	<i>Colchicum umbrosum</i>	2.00	1.86	458	C 1414	<i>Colchicum bivonae</i>	1.90	1.90	562
166	C 4702	<i>Colchicum crocifolium</i>	1.70	4.3	459	C 3502	<i>Colchicum micaceum</i>	1.90	1.90	591
167	C 0706	<i>Colchicum variegatum</i>	2.00	2.41	460	C 2608	<i>Colchicum szovitsii</i>	2.00	2.00	570
168	C 3301	<i>Colchicum ciliatum</i>	2.00	2.34	461	C 5201	<i>Colchicum umbrosum</i>	1.90	1.80	145
169	C 2704	<i>Colchicum sz. ssp. brachyphyllum</i>	1.90	2.34	462	C 5303	<i>Colchicum szovitsii</i>	1.90	1.90	583
170	C 3102	Unknown species and nova	2.00	2.73	463	C 5305	<i>Colchicum umbrosum</i>	2.00	2.00	609
171	C 8006	<i>Colchicum ciliatum</i>	2.00	2.47	464	C 2502	<i>Colchicum szovitsii</i>	1.90	1.90	556
172	C 3602	<i>Colchicum szovitsii</i>	1.90	2.75	465	C 3205	<i>Colchicum szovitsii</i>	1.90	1.90	581
173	C 0104	<i>Colchicum ciliatum</i>	2.00	2.49	466	C 1408	<i>Colchicum bivonae</i>	1.90	1.90	528
174	C 3308	<i>Colchicum polyphyllum</i>	2.00	2.50	467	C 0604	<i>Colchicum triphyllum</i>	1.90	1.90	575
175	C 0712	<i>Colchicum decaysnei</i>	2.00	2.24	468	C 4606	<i>Colchicum szovitsii</i>	1.90	1.90	574
176	C 3201	<i>Colchicum kotschyi</i> (different)	2.00	2.66	469	C 2503	<i>Colchicum lagotum</i>	1.80	1.80	624
177	C 0708	<i>Colchicum decaysnei</i>	2.00	2.73	470	C 7003	<i>Colchicum serpentinum</i>	1.90	1.90	536
178	C 0704/a	<i>Colchicum decaysnei</i>	2.00	2.60	471	C 3305	<i>Colchicum triphyllum</i>	1.90	1.90	608
179	C 8001	Unknown species and nova	2.00	2.69	472	C 1403	<i>Colchicum bivonae</i>	1.90	1.90	589
180	C 0713	<i>Colchicum sangjuicoides</i>	2.00	2.78	473	C 0202	<i>Colchicum sz. ssp. brachyphyllum</i>	1.90	1.90	612
181	C 6104	<i>Colchicum speciosum</i>	2.00	3.36	474	C 2501	<i>Colchicum szovitsii</i>	1.90	1.90	592
182	C 0715	<i>Colchicum variegatum</i>	1.90	2.83	475	C 0602	<i>Colchicum szovitsii</i>	1.90	1.90	576
183	C 0705	<i>Colchicum dolichanthemum</i>	1.80	4.66	476	C 0603	<i>Colchicum triphyllum</i>	1.80	1.80	531
185	C 3304	<i>Colchicum ciliatum</i>	1.90	2.82	477	C 1601	<i>Colchicum szovitsii</i>	1.90	1.90	505
478	C 7005	<i>Colchicum serpentinum</i>	1.80	6.39	E18	C 4605	<i>Colchicum polyphyllum</i>	1.70	1.70	36
479	C 3307	<i>Colchicum serpentinum</i>	2.00	6.01	E19	C 3601	<i>Colchicum szovitsii</i>	1.80	1.80	64
480	C 1409	<i>Colchicum umbrosum</i>	2.00	5.97	E2	C 8004	<i>Colchicum polyphyllum</i>	1.70	1.70	50

Table 2: Continue

Tube Codes	Population code	Species	Purity of DNA (A260/A280)	Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )	Tube codes	Population code	Species	Purity of DNA (A260/A280)	Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )
481	C 3306	<i>Colchicum serpentinum</i>	1.70	78	E20	C 0712	<i>Colchicum decaisnei</i>	1.60	45
482	C 4301	<i>Colchicum triphyllum</i>	1.60	73	E21	C 2201	<i>Colchicum turcicum</i>	1.80	39
483	C 1602	<i>Colchicum umbrosum</i>	1.60	63	E22	C 0707	<i>Colchicum variegatum</i>	1.90	38
484	C 2901	<i>Colchicum szovitsii</i>	1.70	51	E23	C 3302	<i>Colchicum cilicicum</i>	2.00	29
485	C 4807	<i>Colchicum burttii</i>	1.60	112	E24	C 3102	Unknown species and nova	1.80	43
486	C 3501	<i>Colchicum decaisnei</i>	1.70	35	E25	C 6103	<i>Colchicum speciosum</i>	1.90	64
487	C 0301	<i>Colchicum micaceum</i>	1.40	122	E27	C 3901	<i>Colchicum umbrosum</i>	2.10	57
488	C 4501	<i>Colchicum triphyllum</i>	1.80	41	E28	C 2402	<i>Colchicum szovitsii</i>	1.70	48
489	C 2601	<i>Colchicum atticum</i>	1.60	43	E29	C 3309	<i>Colchicum dolichanthemum</i>	1.50	51
490	C 7006	<i>Colchicum szovitsii</i>	1.80	123	E3	C 0605	<i>Colchicum bivonae</i>	1.70	90
491	C 1407	<i>Colchicum bivonae</i>	1.50	48	E30	C 0710	<i>Colchicum decaisnei</i>	1.60	45
492	C 4216	Unknown species and nova	1.70	62	E31	C 8011	<i>Colchicum polyphyllum</i>	1.80	39
493	C 5101	<i>Colchicum serpentinum</i>	1.80	40	E32	C 7701	<i>Colchicum chaldeonicum</i>	1.70	42
494	C 1408	<i>Colchicum bivonae</i>	1.60	70	E34	C 0804	<i>Colchicum umbrosum</i>	1.70	64
495	C 1802	<i>Colchicum triphyllum</i>	1.60	58	E35	C 7901	<i>Colchicum polyphyllum</i>	1.70	57
496	C 0101	<i>Colchicum serpentinum</i>	1.80	64	E36	C 3402	<i>Colchicum chaldeonicum</i>	1.50	52
497	C 1405	<i>Colchicum bivonae</i>	1.90	50	E37	C 0708	<i>Colchicum decaisnei</i>	1.60	99
498	C 0601	<i>Colchicum szovitsii</i>	1.80	29	E38	C 4601	<i>Colchicum serpentinum</i>	1.60	68
499	C 1415	<i>Colchicum speciosum</i>	1.70	49	E39	C 0902	<i>Colchicum variegatum</i>	1.80	64
500	C 5304	<i>Colchicum speciosum</i>	1.50	67	E4	C 0701/b	<i>Colchicum decaisnei</i>	1.90	87
E1	C 0102	<i>Colchicum cilicicum</i>	1.80	58	E40	C 2702	<i>Colchicum persicum</i>	1.60	49
E10	C 7012	<i>Colchicum balansae</i>	1.60	59	E41	C 3202	<i>Colchicum dolichanthemum</i>	1.60	42
E11	C 0709	<i>Colchicum variegatum</i>	1.80	52	E42	C 8003	<i>Colchicum kotschy (different)</i>	1.70	106
E12	C 0805	<i>Colchicum speciosum</i>	1.70	78	E43	C 1408	<i>Colchicum bivonae</i>	1.50	60
E13	C 1502/b	<i>Colchicum variegatum</i>	1.80	38	E44	C 1404	<i>Colchicum bivonae</i>	1.50	62
E14	C 1801	<i>Colchicum speciosum</i>	1.60	40	E45	C 1403	<i>Colchicum bivonae</i>	1.50	109
E15	C 0806	<i>Colchicum speciosum</i>	1.60	360	E46	C 0710	<i>Colchicum decaisnei</i>	1.60	92
E16	C 1502/a	<i>Colchicum baytopiorum</i>	1.70	85	E47	C 1405	<i>Colchicum bivonae</i>	1.60	76
E17	C 0106	<i>Colchicum cilicicum</i>	1.90	58	E5	C 8006	<i>Colchicum cilicicum</i>	2.00	46
E6	C 0704/a	<i>Colchicum decaisnei</i>	1.70	42	E8	C 0703	<i>Colchicum decaisnei</i>	1.80	30
E7	C 8005	<i>Colchicum cilicicum</i>	1.90	57	E9	C 4804	<i>Colchicum linguakatum ssp. rigezensis</i>	2.00	31

Table 3: DNA purity and amount of different *Lilium* and *Nectaroscordum* species

Tube codes	Population code	Genus and species	Purity of DNA (A260/A280)	Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )
L2	L 5303	<i>Lilium ponticum</i> ssp. <i>ponticum</i>	1.91	588
L3	L 6107	<i>Lilium ciliatum</i>	1.91	568
L8	L 3701	<i>Lilium martagon</i>	1.96	557
L10	L 6001	<i>Lilium akkasicum</i>	1.92	703
L13	L 7501	<i>Lilium mon.</i> var. <i>armenum</i>	1.90	620
L14	L 7505	<i>Lilium mon.</i> var. <i>szovitsianum</i>	2.02	588
L16	L 0804	<i>Lilium ponticum</i> ssp. <i>artviense</i>	2.01	597
L18	L 3702	<i>Lilium martagon</i>	1.91	613
L19	L 5306	<i>Lilium ponticum</i> ssp. <i>ponticum</i>	1.95	104
L20	L 5307	<i>Lilium ponticum</i> ssp. <i>ponticum</i>	1.74	120
L21	L 2501	<i>Lilium mon.</i> var. <i>armenum</i>	1.62	68
L22	L 3403	<i>Lilium martagon</i>	1.70	55
L23	L 1401	<i>Lilium martagon</i>	1.64	53
L26	L 3704	<i>Lilium martagon</i>	1.62	45
L27	L 6105	<i>Lilium ciliatum</i>	1.71	103
L29	L 3706	<i>Lilium martagon</i>	1.66	48
L41	L 6108	<i>Lilium ponticum</i> ssp. <i>ponticum</i>	1.80	72
L42	L 7401	<i>Lilium martagon</i>	1.71	106
L44	L 5304	<i>Lilium ponticum</i> ssp. <i>ponticum</i>	1.86	64
L49	L 6104	<i>Lilium ponticum</i> ssp. <i>ponticum</i>	1.90	76
L51	L 0806	<i>Lilium mon.</i> var. <i>armenum</i>	2.00	45
L52	L 2902	<i>Lilium ciliatum</i>	1.71	51
L54	L 6106	<i>Lilium mon.</i> var. <i>armenum</i>	1.82	70
L55	L 3703	<i>Lilium martagon</i>	2.05	57
L57	L 3402	<i>Lilium martagon</i>	1.81	59
L59	L 7502	<i>Lilium kesselringianum</i>	1.82	72
L60	L 2901	<i>Lilium mon.</i> var. <i>armenum</i>	1.81	90
L63	L 5302	<i>Lilium ponticum</i> ssp. <i>ponticum</i>	1.96	73
11	L 6901	<i>Lilium ponticum</i> ssp. <i>ponticum</i>	1.92	355
15	L 5301	<i>Lilium ponticum</i> ssp. <i>ponticum</i>	1.91	315
18	L 6102	<i>Lilium mon.</i> var. <i>armenum</i>	1.98	263
21	L 3401	<i>Lilium martagon</i>	1.99	485
23	L 6101	<i>Lilium ponticum</i> ssp. <i>ponticum</i>	1.90	268
24	L 5201	<i>Lilium akkasicum</i>	1.91	354
25	L 1701	<i>Lilium candidum</i>	1.96	397
29	L 4802	<i>Lilium candidum</i>	1.92	328
34	L 3501	<i>Lilium candidum</i>	1.95	288
35	L 4801	<i>Lilium candidum</i>	1.80	200
38	L 3502	<i>Lilium candidum</i>	1.91	313
77	N 1002	<i>Nectaroscordum siculum</i> var. <i>siculum</i>	1.80	87
33	N 1001	<i>Nectaroscordum siculum</i> var. <i>siculum</i>	1.90	241
98	N 3401	<i>Nectaroscordum siculum</i> var. <i>bulgaricum</i>	2.00	286

not be isolated in sufficient quantities and purity of DNA. It thought to be related with high level of antioxidant content and phenolic compounds of some *Colchicum* species. Sambrook and Russell (2001) mentioned that phenols and polysaccharides are compounds that prevent the DNA purity. Contamination by phenol which is commonly used in nucleic acid purification, can significantly throw off quantification estimates. Phenol absorbs with a peak at 270 nm and a A260/280 of 2. Nucleic acid preparations uncontaminated by phenol should have a A260/280 of around 1.2. Contamination by phenol can significantly contribute to overestimation of DNA concentration. Also Ahmad (2011) and Ebrahimzadeh *et al.* (2010) analysed some *Colchicum* species antioxidant activity, free radical scavenging activity and phenolics compounds. *Colchicum luteum* and *Colchicum speciosum* species reported in these studies that they have a high content.

Similar results were obtained with *Polygonatum*, *Lilium* and *Nectaroscordum* species. The DNA isolation of 42 *Polygonatum* populations was done successfully. This population included 9 species. The purity of DNA values were obtained ranging between 1.60-2.02

The amounts of DNA values were obtained ranging between 37-904  $\mu\text{g } \mu\text{L}^{-1}$  for *Polygonatum* species. The DNA isolation of 39 *Lilium* populations including 8 species was done successfully. The purity of DNA values were obtained ranging between 1.62-2.05 also the amounts of DNA values were obtained ranging between 45-620  $\mu\text{g } \mu\text{L}^{-1}$  for *Lilium* species.

Van Tuyt and Boon (1996), reported the similar results in their study with different *liliums*. They reported that differences in DNA content between varieties and species.

Table 4: DNA purity and amount of different *Polygonatum* species

Tube codes	Population code	Genus and species	Purity of DNA (A260/A280)	Amount of DNA ( $\mu\text{g } \mu\text{L}^{-1}$ )
L01	P 0804	<i>Polygonatum verticillatum</i>	1.91	589
L04	P 2902	<i>Polygonatum orientale</i>	1.90	904
L11	P 3902	<i>Polygonatum hirtum</i>	2.02	563
L12	P 4301	<i>Polygonatum orientale</i>	1.93	638
L15	P 6001	<i>Polygonatum orientale</i>	1.95	930
L17	P 6103/b	<i>Polygonatum verticillatum</i>	1.91	852
L24	P 7501	<i>Polygonatum orientale</i>	1.72	124
L25	P 3903	<i>Polygonatum latifolium</i>	1.62	84
L28	P 7503	<i>Polygonatum sibiricum</i>	1.66	145
L30	P 1403	<i>Polygonatum orientale</i>	1.65	103
L31	P 0801/b	<i>Polygonatum multiflorum</i>	1.71	84
L32	P 5304	<i>Polygonatum verticillatum</i>	1.79	160
L33	P 6701	<i>Polygonatum orientale</i>	1.81	308
L34	P 1401	<i>Polygonatum orientale</i>	1.70	119
L35	P 6104	<i>Polygonatum verticillatum</i>	1.77	147
L36	P 3904	<i>Polygonatum multiflorum</i>	1.62	56
L39	P 5302	<i>Polygonatum multiflorum</i>	1.60	148
L40	P 5303	<i>Polygonatum verticillatum</i>	1.65	105
L43	P 6108	<i>Polygonatum officinale</i>	1.88	340
L45	P 1402	<i>Polygonatum orientale</i>	1.70	102
L46	P 6107	<i>Polygonatum verticillatum</i>	1.83	164
L47	P 2201	<i>Polygonatum latifolium</i>	1.84	58
L48	P 6401	<i>Polygonatum polyanthemum</i>	1.90	130
L50	P 0803	<i>Polygonatum verticillatum</i>	1.85	198
L53	P 7505	<i>Polygonatum glaberrimum</i>	1.86	92
L56	P 1404	<i>Polygonatum orientale</i>	1.93	134
L58	P 3702	<i>Polygonatum orientale</i>	1.90	158
L61	P 7502	<i>Polygonatum verticillatum</i>	1.85	109
L62	P 2903	<i>Polygonatum orientale</i>	1.81	153
L64	P 6105	<i>Polygonatum verticillatum</i>	1.81	213
L65	P 6102	<i>Polygonatum verticillatum</i>	1.85	211
L66	P 1701	<i>Polygonatum orientale</i>	1.87	107
L67	P 3703	<i>Polygonatum orientale</i>	1.85	267
L68	P 7401	<i>Polygonatum orientale</i>	1.85	357
6	P 2401	<i>Polygonatum orientale</i>	1.92	357
12	P 1601	<i>Polygonatum orientale</i>	1.98	370
13	P 0801	Unknown species and nova	1.93	494
16	P 0301	<i>Polygonatum orientale</i>	1.90	455
17	P 5301	<i>Polygonatum orientale</i>	1.91	507
19	P 6101	<i>Polygonatum orientale</i>	1.82	357
20	P 6102	<i>Polygonatum verticillatum</i>	1.84	153
100	P 6103	Unknown species and nova	1.83	37

DNA isolation of 3 including 2 species were also done successfully. The purity of DNA, respectively, 1.80, 1.90 and 2.00 also the amounts of DNA 87, 241 and 286 were obtained.

This study showed that commercial DNA isolation kit can be used successfully for geophytes DNA isolation. Mirmomeni *et al.* (2010) compared three different techniques for optimizing DNA extraction from Paraffin-Embedded Tissues (PETs) in order to generate DNA suitable for PCR. They mentioned that comparison of the electrophoresis pattern in all three methods including commercial DNA isolation kit (Qiagen) indicated that no significant differences were detected and all three methods showed equally efficient results.

### CONCLUSION

This study is one of the most comprehensive studies with different species, cultivars and types of geophytes. In recent years, advances in genetics will help to

provide the introduction of methods are needed. The isolation of pure and high yields of genomic DNA from different sources is essential for many molecular biology studies. Especially important to use methods common to different species also conclusion of these studies can help rapidly. In this study, it was compared different geophyte species DNA quantity and purity collected from the flora of Turkey.

Genomic DNA was extracted from *Colchicum*, *Lilium*, *Polygonatum*, *Iris* and *Nectaroscordum* species with the most widely used method of DNA isolation was modified and used successfully.

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