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Evaluation of the pigments concentration in the Iris species native to Iran

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Abstract

The color and morphology flower is one impressive feature the flower industry. Accumulation of pigments in flowers is determining one of the major factors in flower color. In this experiment accumulation of pigments were evaluated in the Iris species native to Iran. The following were properties were measured, accumulation of chlorophyll a, b and all , anthocyanins, carotenoids of leaves and flowers and heritability percent. The results showed that the *Iris acutiloba* was highest concentration anthocyanins and carotenoids of pigments than the other species. Most of the heritability was observed of the b chlorophyll pigments.

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Introduction

Irises is a perennial plants of the Iridaceae family (Khalighi, 2003). Iris flower has a wide range of colors including white, yellow, orange, brown and black (Austin, 2005). Accumulation of pigments in flowers are the major factors in determining flowers color (Ashtakala and Forvard, 1971). Flower color is the main factor in determining the market value of ornamental plants and flowers (Ying tu and Kuang vang, 2006).Flower colors is three main classes include of flavonoids, carotenoids and btalayn (Scolnik and Bartley, 1995). So far, The flower have identified about 600 tyes of carotenoids, 7000 kinds of flavonoids and more than 500 kinds of anthocyanins (Davis, 2004).

Flower color is mainly determined by anthocyanins (Yukihisa *et al*, 2007).The pathway leading to anthocyanidin 3-glucoside is generally conserved among higher plant species (Grotewold 2006, Tanaka and Brugliera 2006). Flavonoids consist of more than 10 lasses of compounds, Anthocyanins confer orange, red, magenta, violet and blue Colours (Yoshikazu, 2009). Petunia lack brick red/orange varieties due to the lack of pelargonidin-based anthocyanins because their dihydroflavonol 4-reductases (DFRs) do not utilize dihydrokaempferol as a substrate (Forkmann and Heller 1999, Johnson *et al*. 1999).

Carotenoids are plant pigments that function as antioxidants, hormone precursors, colourants and essential components of the photosynthetic apparatus (Crispin and Barry, 2006).

The highest total flavone content of *Campanula isophylla* was reached at anthesis, after which it remained almost constant, but with some changes in the proportion of individual compounds (Justesen *et al*, 1997).

Flower color is one of the most attractive features of ornamental plants. Color flower is changed, one of the main objective of the Iris flower breeding. The purpose of this experiment, is investigated the accumulation of the pigments and the heritability of the pigments in the 8 Iris species.

material and Methods

Plant material

The 8 Iris species were collected from Zanjan provience of Iran country and were planted in field of Khorramdarreh city and are accurately identified by using the resources of Flora Iranika, Tulipa and Irises of Iran and the site of international plant name. The experiment was conducted to purpose investigation of pigments concentration and their heritability percent in 8 species of Irises of 10 replications.

The following were properties were measured, accumulation of chlorophyll a, b and all , anthocyanins, carotenoids, heritability percent.

Chlorophyll a,b and all and Cartenoids measurment

Chlorophyll content is obtained by rinsed in 80% acetone solution and measuring its absorbance using spectrophotometer at 645 and 663 nm (Arnon, 1949), and Cartenoids content of petals and leaf at 480 and 510 nm, estimation value were calculated according to the following formula:

Chlorophylle a $mg/g= 12.7(A_{663})- 2.69(A_{645})\times V/1000\times 10$

Chlorophylle b $mg/g= 22.9(A_{645})- 4.68(A_{663})\times V/1000\times 10$

Chlorophylle all $mg/g= 20.2(A_{645})- 8.02(A_{663})\times V/1000\times 10$

Cartenoids $mg/g= 7.6(A_{480})- 1.49(A_{510})\times V/1000\times 10$

Anthocyanins measurment

Anthocyanins is exteracted with acidified methanol and measuring its absorbance using spectrophotometer at 550 nm (Wagner, 1979), estimation value were calculated according to the following formula

A=£bc

Heritability percent

Heritability percent estimation value was calculated according to the following formula (Aghahi *et al*, 12012):

$$h^2 = \frac{\sigma_g^2}{\sigma_p^2}$$

Statistical Analysis

Data were analyzed by the MSTAT-C software, and the comparison means was done Duncans multiple range (DMRT) test and Graphs were plotted using Excel software.

Results and discussion

Chlorophyll a, b and all analysis

Results has revealed that Irises a high color variation. Similar results were also reported by Yabochi *et al* (2006) of japanies Irises. The chlorophyll a, b and all concentration in *Iris meda* 2 were lower than in other species. But the amount of chlorophyll a, b and all accumulation did not differ significantly from each other species(Fig 1). *Iris acutiloba*, *Iris meda* 1 and *Iris meda* 3 species were with the highest concentration of chlorophyll b in their leaves (Table 1). The chlorophyll b concentration in the leaves are suitable for the study of the plant resistance to environmental conditions (Damir *et al*, 2008). Most of the heritability was of the chlorophyll b concentration in leaves (Table 2). Which confirms the necessity and importance of chlorophyll b in photosynthesis and resistance to environmental conditions.

Table 1. Comparison of the accumulation of pigments.

Species	Chlorophyll a mg/g	Chlorophyll b mg/g
I.reticulata 1	23.91 ab	8.16 def
I.reticulata 2	28.47 a	13.36 bcd
I.pseudocaucasica	26.90 a	11.12 cdef
I.persica	27.41 a	12.46 bcde
I.acutiloba	26.99 a	17.38 ab
I.meda 1	27.95 a	17.77 ab
I.meda 2	18.09 b	7.04 ef
I.meda 3	25.66 ab	21.16 a

Means followed by similar letters in each column are not significantly at 1% level by using Duncan multiple range test

Table 2. Heritability percent of traits.

trait	Heritability %
Chlorophyll a	55.44
Chlorophyll b	90.06
Chlorophyll all	76.54
Anthocyanin	50.79
Cartenids of leaves	52.95
Cartenids of flowers	61.04

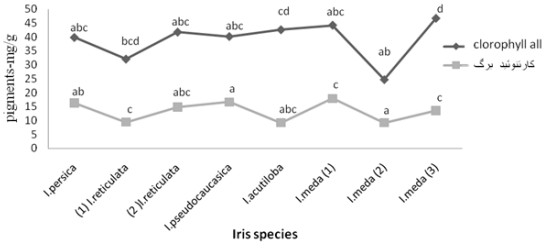

Fig. 1. accumulation chlorophyll all and cartenoids at leaves of Iris species.

Anthocyanin analysis

Iris acutiloba and *Iris reticulata* 2 was not significant difference together in the rate of accumulation of anthocyanins in the petals, but compared to other species had the highest rate of accumulation of anthocyanins (Fig 2).Anthocyanins are common floral pigments that give rise to blue, purple and red colors and flavnoid biosynthetic pathway responsible for anthocyanin pigmentation is highly conserved (Winkel-shirley, 2002). Anthocyanin structure, type and concentration, co- existing compounds (co-pigments), metal ion type and concentration, PH of vacuoles anthocyanin localization and shape of surface cells all contribute to final flower colour (Yoshida *et al*, 2009).

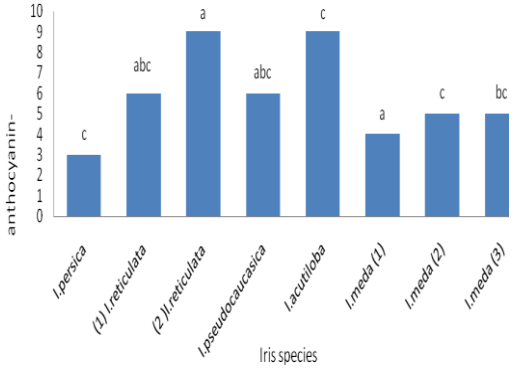

Fig. 2. accumulation anthocyanin of Iris species of flowers.

Cartenoids analysis

The highest cartenoids concentration was observed in *Iris meda* 1 and *Iris pseudocaucasica* leaves (Fig 1). But the highest cartenoids concentration was observed in *Iris acutiloba* flowers (Fig 3). The accumulation of cartenoids in leaves was negatively correlated with the accumulation of cartenoids in flower.

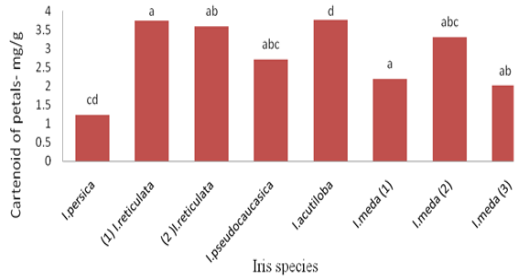

Fig. 3. accumulation cartenoids of Iris species petals.

Conclusion

Then the study eight Iris species, that found the *Iris acutiloba* was highest accumulation of anthocyanin and cartenoids in petals to other species. So can of *Iris acutiloba* the breeding work used of the change the Iris color flowers.

Refrence

Agahi K, Fotokian MH, Younesi Z. 2012. Study of genetic diversity and important correlations of agronomic traits in rice genotypes (*Oryza sativa* L.). J. Iranian biology. **25,** 97- 110

Arnon DI, 1949. Plant physiol. **24**, 1.

Ashtakala SS, Forward DF. 1971**.** Pigmentation in iris hybrids: occurence of flavonoid pigments in six cultivars of, Iris germanica, Canadian Journal of Botany 49.

Austin C. 2005, Irises a gardeners encyclopedia. Timber Press.

Crispin A. H, Barry JP. 2006. Carotenoid accumulation and function in seeds and non-green tissues. *Plant, Cell and Environment*. **29**, 435–445.

Davies PH. 2004. Flora of turkey and the east Aegean islands. Edinburgh. **8**,10.

Damir V, Mirko O, Nenad J. 2008. The deep chlorophyll maximum in the coastal north eastern Adriatic Sea**,** Acta Bot. Croat. **67**, 33–43.

Forkmann G, Heller W. 1999. Biosynthesis of flavonoids.In Polyketides and Other Secondary Metabolites Including Fatty Acids and Their Derivatives. Edited by Sankawa, Elsevier, 713–748.

Grotewold E. 2006. The genetics and biochemistry of floral pigments. Annu. Rev. Plant Biol. **57.** 761–780.

Justesen H, Andersen AS, Brandt K. 1997, Accumulation of Anthocyanins and Flavones during Bud and Flower Development in *Campanula isophylla* Moretti. *Annals of Botany,* **79**. 355-360.

Johnson ET, Yi H, Shin B, Oh BJ, Cheong H, Choi G. 1999, Cymbidium hybrida dihydroflavonol 4-reductase does not efficiently reduce dihydrokaempferol to produce orange pelargonidin-type anthocyanins. Plant J. **19,** 81–85.

Khlighi A. 2003 , floriculture, 157.

Scolnik PA, Bartley GF. 1995. Nucleotide sequence of lycopen cyclase (Genbank L40176) from arabidopsis. Plant Physiol. **108**. 1343

Tanaka Y, Brugliera F. 2006. Flower colour. In Flowering and its Manipulation. edited by Ainsworth, Blackwell, Oxford. 201–239..

Winkel-shirley B. 2002. Biosynthesis of flavonoids and effects of stress, Curr. Opin. Plant Biol, **5**, 218-223.

Wagner GJ. 1979. Content and vacuole/extra vacuole distribution of netural sugars, Free amino acid and Anthocyanins in protoplasts. Plant physiology**. 64**, 88-93.

Yoshida K, Mori M, Kondo T. 2009. Blue flower color development by anthocyanins from chemical structure to cell physiology, Nat. Prod. Rep, **26**, 884-915.

Yoshikazu T, Filippa B, Steve C. 2009, Recent Progress of Flower Colour Modification by Biotechnology. *Int. J. Mol. Sci.* **10,** 5350-5369

Ying to K, Kuen Wang C. 2006, Molecular breeding of flower, Floriculture, ornamental and plant biotechnology. 300-310.

Yukihisa K, Masako F, Yuko F, Filippa B, Timothy A, Mirko K, Noriko N, Keiko Y, Junichi T, Alix P, Guo-Qing T, Narender S, Chin-Yi L, Barry K, Shinzo T, Toshihiko A, Takaaki K, John G, Yoshikazu T. 2007. Engineering of the Rose Flavonoid Biosynthetic Pathway Successfully Generated Blue-Hued Flowers Accumulating Delphinidin. Plant Cell Physiol. **48**. 1589–1600.