



Colours Obtained from Safflower (*Carthamus tinctorius* L.) Types and Their Fastness Values

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Safflower is planted on small fields in the world among single year oily flowering plants. Today, nearly 50 % of the vegetable oils consumed in Turkey is imported. Safflower, being an alternative oil plant, can be raised easily in arid regions. This plant has resistance against cold, drought and salinity stress. In this study, when C1 = Yenice (spineless, orange coloured), C2 = Dinçer (spineless, red coloured) and C3 = Remzibey-05 (spined, yellow coloured) safflower types are used in dyeing, the determination of light and abrasion fastness values are aimed.

Key Words: Natural dyeing, Safflower, Light fastness, Abrasion fastness.

INTRODUCTION

Safflower is planted on small fields in the world among single year oily flowering plants. Today, nearly 50 % of the vegetable oils consumed in Turkey is imported. Safflower, being an alternative oil plant, can be raised easily in arid regions thanks to its resistance to cold, drought and salinity stress. Its planting can successfully be made in dried soils of regions with insufficient rain just like in Central Anatolia and Ankara, Eskisehir, Konya and Çankiri. Along with changing according to varieties, there is 20-45 % fat content in their seeds. It helps reducing the cholesterol level in blood owing to the high linoleic acid, of which fat is an unsaturated fatty acid. This fat is also used for cooking purposes as soft butter and salad oil. It is demanded in oil colour industry because of its quick dry property. Plant time and spacing can be counted among the important factors affecting the oil quality and seed efficiency in safflower plant.

In this study, when C1 = Yenice (spineless, orange coloured), C2 = Dinçer (spineless, red coloured) and C3 = Remzibey-05 (spined, yellow coloured) safflower types are used in dyeing, the determination of light and abrasion fastness values are aimed.

The study was conducted on Ankara University Faculty of Agriculture Department of Field Crops practice fields. Three types of safflower on main parcels; C1 = Yenice (spineless, orange coloured), C2 = Dinçer (spineless, red coloured) and C3 = Remzibey-05 (spined, yellow coloured), were used. Line

spacing (S1 = 20, S2 = 30 and S3 = 40 cm) were installed on low parcels. Ranges over spacing were taken as 20 cm. These types were reclaimed by Anadolu Agricultural Research Institute and adapted to dry land conditions of Central Anatolia. Separated parcels in practice blocks were planned as 3 repetitive in practice pattern. (A = 1. repetition, B = 2. repetition, C = 3. repetition). Each one of the parcels were formed as 5 lines from 5 meters length.

EXPERIMENTAL

The materials of the experiment consists of safflower (*Carthamus tinctorius* L.) plants, wool carpet and rug yarns without dyeing, iron sulfate and copper sulfate mordants.

A total of 81 dyeing were made by using 2 different dyeing methods as 2 types of mordants as without mordant and pre-mordant in this study, which is made by using safflower types. 3 % of mordant and 100 % safflower plant were used according to the weight of woolen carpet and rug yarns.

Mordant of woolen carpet and rug yarns: Two different mordant were used as iron sulfate and copper sulfate in the research. 3 % Sample of mordant taken according to the weight of woolen yarn that is going to the dyed, which is mentioned above, were melted in warm water in 1/50 ratio. Mordant process were completed by boiling woolen yarns, which were made humid by washing, for 1 h in this water with mordant.

Preparation of dye extract: To obtain the penetration of dye matter to water, dried whole plants were broken up into small pieces. Whole plants were taken in accordance with wool

carpet and rug yarns weight at the rate of the 100 %. Pure water was used in accordance with wool carpet and rug yarns weight at the rate of the 1/50. And then plant pieces were boiled in this water for 1 h. At the end of time plants remnants were filtered and putted away from the water. In this way dye extract was obtained.

Dyeing wool carpet and rug yarns with safflower

Dyeing without mordant: Previously damped wool carpet and rug yarns were boiled in dye extract for 1 h. During the boiling decreased water was added equal to vapourized amount. Then it was cooled, rinsed with cold water and dried at shading and airy place.

Dyeing with mordant: Firstly, wool carpet and rug yarns were dyed and mordanted. For this action, in conformity with the weight of wool carpet and rug yarns that were dyed, 3 % the iron sulfate and copper sulfate were taken and they were dissolved in water. Then, wool carpet and rug yarns were mordanted was put in water and boiled for 1 h. After 1 h, wool carpet and rug yarns were ready for dyeing by wringing. Mordanted wool carpet and rug yarns were boiled in the previously prepared dye extract for 1 h. Then, it was cooled, rinsed with cold water and dried at shading and airy place.

Evaluation of obtained colour with subjective method: Naming obtained colours was arranged subjectively. Obtained colours with these methods were named by the commission consisted of specialists of Ankara University Home Economics.

For the naming, dyed wool carpet and rug yarn samples were spread on a white ground where the sunlight comes from the side and they formed into groups according to their colours and tone differences. Harmancioglu¹ was considered for the naming of the colours.

Light fastness determination: Light fastness determination was done according to TS 867 prepared by TSE (for dyed or pressed textiles colour fastness testing methods-colour fastness determination methods facing sunlight)² and DIN 5033 (Farbmessung Begriffe der Fabrmotrik)³.

Abrasion fastness determination: Abrasion fastness determination was done according to TS 717 prepared by TSE (for dyed or pressed textiles colour fastness testing methods-determination of colour fastness to abrasion)⁴ and TS 423 (using methods of the fray scale for sum up the staining leaking of dye and discolouring changing of colour in the determination of colour fastness of textiles)⁵.

RESULTS AND DISCUSSION

By using AÇ₁S₁, AÇ₂S₂, AÇ₁S₂, AÇ₂S₁, AÇ₂S₃, AÇ₁S₃, AÇ₃S₁, AÇ₃S₂, AÇ₃S₃, BÇ₁S₁, BÇ₂S₂, BÇ₁S₂, BÇ₂S₁, BÇ₂S₃, BÇ₁S₃, BÇ₃S₁, BÇ₃S₂, BÇ₃S₃, CÇ₁S₁, CÇ₂S₂, CÇ₁S₂, CÇ₂S₁, CÇ₂S₃, CÇ₁S₃, CÇ₃S₁, CÇ₃S₂, CÇ₃S₃ types of safflower without mordant or iron sulfate, copper sulfate mordant, 81 woolen carpet and rug yarns were dyed. Subjective evaluation, light and abrasion fastness values of the obtained colours were given in Table-1.

When we examine Table-1, as a result of the dyeing of woolen carpet and rug yarns; light caraway, caraway, dark caraway, dry oak leaf, dark dry oak leaf, cream, baked apple, dark baked apple, amber, dark amber, mustard, dark mustard, light quince, quince, light straw yellow, straw yellow, light

virgin olive oil, dark honey, dark bone, bone, light khaki, vine leaves, green-yellow and dirty yellow colours were obtained. The colours that are obtained, are the colours used generally in handmade woolen carpet and rug yarns.

When their light fastness is examined, it can be seen that light fastness values between 1 and 6 are changing. It is determined that high values in light fastness are obtained from copper sulfate and iron sulfate mordant and low values are obtained from dyeing without mordant. Light fastness values are found to be high in dyeing with mordant when compared to dyeing without mordant.

The values obtained from abrasion fastness change between 1 and 4-5. 4-5, which is the highest among abrasion fastness values, was obtained from dyeing without mordant of the types, which is from 1. Repetition Yenice (spineless, orange coloured) line spacing 30 cm and 3. Repetition Remzibey-05 (spined, yellow coloured) spacing 30 cm. 1, which is the lowest value; was obtained from dyeing with iron sulfate mordant of safflower types, which are 3. Repetition Dinçer (spineless, red coloured) line spacing 20 cm, 2. Repetition Remzibey-05 (spined, yellow coloured) line spacing 40 cm and 2. Repetition Yenice (spineless, orange coloured) line spacing 20 cm.

There is all-round utilization chance from safflower plant. However, the required importance wasn't given in Turkey. Compared to other oil plants, it is a promising plant due to some of its superior properties. Safflower has strong root structure. When it is grown in arid region, it can take advantage of water in the soil. Safflower comes forefront of the plants that should really be applied in order to reduce fallow areas and evaluate in terms of economy especially in semi-arid regions. Because of its durability to low temperatures and aridness and being not selective in terms of climate and soil demands, it is essential that this plant should be inserted in fallow fields of central Anatolia and transition regions⁶.

In present study, a total of 81 dyeing were made by using 27 types of safflower, which is a plant growing in Turkey, without mordant and using 2 types of mordant (copper sulfate and iron sulfate). As a result of the dyeing made, several colours given by safflower plant to woolen carpet and rug yarns were examined. As a result of the dyeing; light caraway, caraway, dark caraway, dead oak leaf, dark dead oak leaf, cream, baked apple, dark baked apple, amber, dark amber, mustard, dark mustard, light quince, quince, light straw yellow, straw yellow, light virgin olive oil, dark centrifugal honey, dark bone, light khaki, vine leaves preserved, green-yellow and dirty yellow colours were obtained. Colours that are obtained, are the colours generally used in handmade woolen carpet and rug yarns.

When their light fastness is examined, it can be seen that light fastness values between 1 and 6 are changing. It is determined that high values in light fastness are obtained from copper sulfate and iron sulfate mordant and low values are obtained from dyeing without mordant. Light fastness values are found to be high in dyeing with mordant when compared to dyeing without mordant.

The values obtained by Kayabasi⁷ and Basalma *et al.*⁸ shows similarity with the colours, light and abrasion fastness values obtained in this study. The values obtained from abrasion

TABLE-1
COLOURS OBTAINED FROM SAFFLOWER (*Carthamus tinctorius* L.) PLANT, LIGHT AND ABRASION FASTNESS VALUES

Safflower varieties	Mordants	Colours	Light fastness values	Abrasion fastness values
AÇ ₁ S ₁	Copper sulfate	Light caraway	4	3
	Iron sulfate	Dark dry oak leaf	4	2
	Without mordant	Cream	2	3
AÇ ₁ S ₂	Copper sulfate	Caraway	4	3
	Iron sulfate	Baked apple	4	2-3
	Without mordant	Cream	3	4-5
AÇ ₁ S ₃	Copper sulfate	Light caraway	5	3
	Iron sulfate	Light caraway	5	2
	Without mordant	Amber	3	3
AÇ ₂ S ₁	Copper sulfate	Dark mustard	5	3
	Iron sulfate	Dark caraway	4	1-2
	Without mordant	Quince	3	3
AÇ ₂ S ₂	Copper sulfate	Dark mustard	4	3-4
	Iron sulfate	Dark dry oak leaf	5	1-2
	Without mordant	Straw yellow	2	4
AÇ ₂ S ₃	Copper sulfate	Light caraway	4	3
	Iron sulfate	Dry oak leaf	5	2-3
	Without mordant	Quince	3	3-4
AÇ ₃ S ₁	Copper sulfate	Light caraway	4	3
	Iron sulfate	Dark mustard	4	2
	Without mordant	Amber	3	3-4
AÇ ₃ S ₂	Copper sulfate	Amber	4	3-4
	Iron sulfate	Dry oak leaf	4	1-2
	Without mordant	Mustard	3	3-4
AÇ ₃ S ₃	Copper sulfate	Light virgin olive oil	5	3
	Iron sulfate	Dark dry oak leaf	3	2
	Without mordant	Amber	3	3
BÇ ₁ S ₁	Copper sulfate	Light caraway	4	2-3
	Iron sulfate	Dark honey	4	1
	Without mordant	Straw yellow	2	4
BÇ ₁ S ₂	Copper sulfate	Dark mustard	4	3
	Iron sulfate	Dry oak leaf	5	2
	Without mordant	Bone	3	3-4
BÇ ₁ S ₃	Copper sulfate	Light khaki	5	3
	Iron sulfate	Dry oak leaf	4	1-2
	Without mordant	Light quince	2	3-4
BÇ ₂ S ₁	Copper sulfate	Dark mustard	5	2-3
	Iron sulfate	Dark dry oak leaf	5	2
	Without mordant	Bone	2	3-4
BÇ ₂ S ₂	Copper sulfate	Caraway	4	3
	Iron sulfate	Dark caraway	4	1-2
	Without mordant	Light straw yellow	3	3
BÇ ₂ S ₃	Copper sulfate	Light caraway	5	3
	Iron sulfate	Dark mustard	4	1-2
	Without mordant	Light quince	2	4
BÇ ₃ S ₁	Copper sulfate	Light caraway	4	3
	Iron sulfate	Dry oak leaf	4	2
	Without mordant	Amber	3	4
BÇ ₃ S ₂	Copper sulfate	Light caraway	4	3
	Iron sulfate	Vine leaves	4	1-2
	Without mordant	Bone	3	4
BÇ ₃ S ₃	Copper sulfate	Light caraway	4	3
	Iron sulfate	Dark baked apple	4	1
	Without mordant	Dark amber	3	3-4
CÇ ₁ S ₁	Copper sulfate	Light virgin olive oil	2	3
	Iron sulfate	Dry oak leaf	5	2-3
	Without mordant	Dark bone	3	3-4
CÇ ₁ S ₂	Copper sulfate	Light caraway	4	3-4
	Iron sulfate	Baked apple	4	3
	Without mordant	Amber	3	3-4

Safflower varieties	Mordants	Colours	Light fastness values	Abrasion fastness values
CÇ ₁ S ₃	Copper sulfate	Light khaki	5	3
	Iron sulfate	Dry oak leaf	4	2
	Without mordant	Amber	2	2-3
CÇ ₂ S ₁	Copper sulfate	Light caraway	5	3
	Iron sulfate	Dry oak leaf	4	1
	Without mordant	Dark bone	3	3-4
CÇ ₂ S ₂	Copper sulfate	Green-yellow	4	3
	Iron sulfate	Dirty yellow	4	2
	Without mordant	Quince	2	3-4
CÇ ₂ S ₃	Copper sulfate	Light virgin olive oil	4	3
	Iron sulfate	Dark caraway	4	2
	Without mordant	Straw yellow	1	3-4
CÇ ₃ S ₁	Copper sulfate	Light khaki	4	3
	Iron sulfate	Dark mustard	4	2
	Without mordant	Light quince	2	3-4
CÇ ₃ S ₂	Copper sulfate	Light caraway	4	3
	Iron sulfate	Dry oak leaf	6	1-2
	Without mordant	Straw yellow	3	4-5
CÇ ₃ S ₃	Copper sulfate	Light khaki	4	3
	Iron sulfate	Dark dry oak leaf	4	2
	Without mordant	Quince	3	3-4

fastness change between 1 and 4-5. 4-5, which is the highest among abrasion fastness values, was obtained from dyeing without mordant of the types, which is from 1 repetition Yenice (spineless, orange colored) line spacing 30 cm and 3. Repetition Remzibey-05 (spined, yellow colored) spacing 30 cm. 1, which is the lowest value was obtained from dyeing with iron sulfate mordant of safflower types, which are 3. Repetition Dinçer (spineless, red colored) line spacing 20 cm, 2. Repetition Remzibey-05 (spined, yellow colored) line spacing 40 cm and 2. Repetition Yenice (spineless, orange colored) line spacing 20 cm.

REFERENCES

1. M. Harmancıoğlu, Fastness Levels, on Wool Against Various Effects, of Colours Obtained From Important Plant Dyes in Turkey, University of Ankara, Agriculture Faculty Press, Number: 77, University of Ankara Press, Ankara (1955) (In Turkish).
2. Anonymous, Colour Fastness Experiment Methods for Dyed or Pressed Textiles Determination of Colour Fastness According to Sunlight, Public of TSE, TS 867, Ankara (In Turkish) (1984).
3. Anonymous, DIN 5033 (Farbmessung Begriffe Der Farbmatrik) Deutschland (1970).
4. Anonymous, Colour Fastness Experiment Methods for Dyed or Pressed Textiles Determination of Colour Fastness According to Abrasion, Public of TSE, TS 717, Ankara (In Turkish) (1978).
5. Anonymous, Methods of the Using of the Gray Scale for Sum Up the Staining (Leaking of Dye) and Discolouring (Changing of Colour) for the Determination of Colour Fastness Values of Textiles, Public of TSE, TS 423, Ankara (In Turkish) (1984).
6. B. Gürbüz, *J. Ministry of Agric. Rural Affairs*, **18**, 19 (1987) (In Turkish).
7. N. Kayabasi, *J. Agric. Sci.*, **4**, 56 (1998) (In Turkish).
8. D. Basalma, N. Kayabasi and B. Gürbüz, *Asian J. Chem.*, **20**, 6358 (2008).