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Determination of Dyeing Properties of Spearmint (*Mentha spicata* var. *spicata*)

SÜLEYMAN KIZIL[1] AND NURAN KAYABAŞI†
Department of Field Crops, Faculty of Agriculture, University of Dicle, 21280 Diyarbakır, Turkey
†Department of Village Handicrafts, College of Home Economy, Faculty of Agriculture, Ankara University, 06110 Ankara, Turkey
[1]Corresponding author's e-mail: kizils@dicle.edu.tr

ABSTRACT

The study reports determination of dyeing characteristics of spearmint in vegetable dyeing. Totally, 25 dyeings were performed for each of the four dyeing methods used i.e. no mordanting, pre mordanting, mordanting and post mordanting with alum of aluminium, copper-sulphate, zinc-chloride, potassium-bichromate, sodium chloride, sodium sulphate, sodium sulphite and iron-sulphate as mordant. Light fastness of colours varied between 2 and 8, abrasion fastness between 1 - 2 and 4 and wet water spotting fastness between 3 and 5; dry water spotting of 5 with various tones of green.

Key Words: Spearmint; *Mentha spicata* var. *spicata*; Dyeing; Fastnesses

INTRODUCTION

Historically, natural dyes have been used to color clothing or other textiles. By the early part of this century, only a small percentage of textile dyes were extracted from plants. Lately there has been increasing interest in natural dyes, as the public becomes aware of ecological and environmental problems related to the use of synthetic dyes (TLL, 1997; Piccaglia & Venturi, 1998).

Plant colourants are used in colouring foods, textiles, cosmetics and pharmaceutical preparations. To promote the marketing of these colourants, it is necessary to develop the cultivation of the dye plants (Piccaglia & venturi, 1998; Türkmen *et al*., 2004). Colourant-containing plants are unlikely to be available as fresh material all year round but have a seasonal production cycle. Where the colourant is present in the flowers, berries or leaves it may be possible to preserve the material and retain the colourant. One of the most important problems of vegetable dyeing is the lack of ready material for dyeing. However, spearmint is cultivated commonly throughout Turkey and the world. It is found easily, could be preserved as dry material and could be considered as a new dye plant due to its colours. The plant is mainly used as salad, spice and for tea besides mint herbage used for wool dyeing (Turkish Republic Ministry of Industry & Commerce, 1991).

The objective of the present study was to determine dyeing properties of *Mentha spicata* var. *spicata* leaves using different mordant and dyeing methods.

MATERIALS AND METHODS

Spearmint was grown in Department of Field Crops, Faculty of Agriculture, Dicle University. Plants were harvested at full blooming stage. Fresh herb was dried for two days at 35^0C.

Un-dyed woollen carpet yarns used in dyeing were natural white and had a thickness degree of 2.5 number. Alum of aluminium, copper-sulphate, zinc-chloride, potassium bichromate, sodium chloride, sodium sulphate, sodium sulphite and iron-sulphate were used as mordant.

Dyeing process. Pre-mordanting, post mordanting, with and no mordanting methods were used to dye the wool. Preparation of dye extract was the same in all dyeing methods. Dry leaves of spearmint were chopped and weighed equal to woollen yarn taken separately and boiled in water in the ratio of 1:50 for one hour followed by filtering the remainders with extraction of dye.

In the no mordanting method; previously damped woollen yarn was boiled in dye extract for one hour followed by cooling and rinsing in cold water and drying in cool dry shady place. In the pre-mordanting method; 3% (w/w) mordant (out of woollen yarn weight) was used separately by dissolving in the tepid water, which was 50 times heavier than the woollen yarn, then previously dampened yarn was boiled in this water for one hour. Woollen yarn taken from water was ready to dye after pressing. In the mordanting method; when wool yarns were put in dye extract, each of the mordants were added at the same time in this extract and boiled together for one hour with dyeing and mordanting at the same time. In the post mordanting method; first, woollen yarn was dyed just like no mordanting method and then each mordant was used separately by dissolving in the tepid water (50 times heavier than previously dyed woollen yarn, which was added in this water) followed by boiling for one hour.

A total of 25 dyeings were performed. Colours obtained by the dyeing were identified by spreading, dyed

Table I. The colours obtained from spearmint and, light, abrasion, dry along with their wet water spotting fastness

Dyeing methods	Mordant name	Mordant rate	Colours	Light fastness	Abrasion fastness	Water spotting fastness	
						Wet	Dry
	Alum of aluminium	3	Yellowish green	4	2-3	3	5
	Copper-sulphate	3	Free khaki	4	3	3	5
	Zinc-chloride	3	Free saltwater leaf	3	3	4	5
Pre-mordanting	Potassium-bichromate	3	Dark mustard	6	2-3	3	5
	Sodium chloride	3	Free khaki	3	3-4	4	5
	Sodium sulphate	3	Lemon mouldy	3	3-4	4	5
	Sodium sulphite	3	Lemon mouldy	3	3	3	5
	Iron-sulphate	3	Pimento	7	2	3-4	5
	Alum of aluminium	3	Yellowish green	3	3	4-5	5
	Copper-sulphate	3	Khaki	5	2-3	3-4	5
	Zinc-chloride	3	Free bleeding olive oil	3	3	4-5	5
mordanting	Potassium-bichromate	3	Dark coffee-green	5	3	5	5
	Sodium chloride	3	Free coffee-green	6	3	3	5
	Sodium sulphate	3	Dark lemon mouldy	5	4	4	5
	Sodium sulphite	3	Cumin	6	3	5	5
	Iron-sulphate	3	Naphtha green	8	2	3	5
	Alum of aluminium	3	Free bleeding olive oil	3	3	4-5	5
	Copper-sulphate	3	Dark khaki	8	1-2	4	5
	Zinc-chloride	3	Coffee-green	6	3	3	5
Post-mordanting	Potassium-bichromate	3	Walnut green	7	3	3	5
	Sodium chloride	3	Saltwater leaf	2	2-3	3-4	5
	Sodium sulphate	3	Cumin	2	3	3-4	5
	Sodium sulphite	3	Free khaki	5	3-4	4	5
	Iron-sulphate	3	Naphtha green	8	2	3	5
Non-mordant			Pimento	5	2-3	5	5

woollen samples on the white back ground receiving sun light from the side. These were separated based on colour differences and common colour names scheme (Kayabaşı, 1995).

Determination of colour fastnesses. Light fastness determination was carried out on the basis of Turkish Standard Institute 867 (TSI, 1984) prepared by Turkish Standard Institute (colour fatness determination methods according to the sunlight) and Farbmessung Begrifte der Farbmetrik (Deutsche Institute Norms, 1970).

Abrasion fastness determination was carried out according to the TSI 717 (1978) (determination of colour fatness according to abrasion) prepared by Turkish Standard Institute and TSI 423 (1984) (using the methods of grey scale to sum up the staining "leaking of dye" and discolouring "changing of colour", in the determination of colour fastness of textiles).

Water fastness determination was made according to the TSI 399 (1978) (determination of colour fastness according to water spotting), prepared by Turkish Standard Institute, and TSI 423 (1984).

RESULTS AND DISCUSSION

Colours obtained through dyeings and the fastness of colours such as light, abrasion, dry and wet water spotting (Table I) included various tones of green, such as yellowish green, free khaki, lemon mouldy, pimento, cumin, naphtha green and walnut green, which are popularly used in hand-woven carpets and kilims industry.

Light fastness values (Table I) showed range of 2 to 8. The minimum value 2 was obtained from dyeing with sodium chloride and the maximum value of 8 obtained from sodium sulphate, respectively. The abrasion fastness values varied between 1 - 2 and 3 - 4. These values are at medium and good level. Wet water-spotting fastness values varied between 3 and 5 and all dry water-spotting fastnesses were found as 5, at a medium and good level, no staining was observed on the wool, after water dried out.

Harmancıoğlu (1951) reported that *Mentha tomentosa* showed light fastness between 2 and 5, washing fastness between 4 and 5 and abrasion fastness between 3 - 5. In addition, obtained colours were beige, khaki, black-green and apricot yellow. Ölmez (2002) stated that colours obtained from mint (*M. tomentosa*) were light green, light khaki green and greenish straw yellow with the fastness values of light as 6 - 7, abrasion fastness for weight as 4 - 5 and 5, dry abrasion as 3 - 4. Colour fastness values of our study are compatible with data reported by these researchers.

CONCLUSION

Spearmint is widely used and cultivated as a spice throughout the world and has a variety of uses. It is valued for its essential oil as for its colouring properties, and it can be used as a vegetable dye source for hand woven materials. The colours obtained through dyeing with spearmint showed different shades of green with fastness of colours at medium level, especially in relation to fastness to light and dry water spotting.

REFERENCES

Deutsche Institute Norms, 1970. *DIN 5033. Farbmessung Begrifte der Farbmetrik*. Deutschland

Harmancıoğlu, M., 1951. *Fastness Grades of Colours Obtained from Major Dye Plants Found in Turkey on Woollen Yarns Against Various Factors,* P: 212. Publication No. 77 Faculty of Agriculture, Ankara University, Turkey

Kayabaşı, N., 1995. A Research on the colours of buckthorn (*Rhamnus petiolaris*) and their colour fastnesses on wool carpet yarns. *Ph.D. Thesis*, P: 119. Department of Home Economics, Graduate School of Natural and Applied Sciences, Ankara University, Turkey

Ölmez, F.N., 2002. Colours obtained from dyeing of wool carpet yarns with double dyeing method and some fastness values. *J. Graduate School of Natural and Applied Sciences, Suleyman Demirel University, Isparta, Turkey,* 113–29

Piccaglia, R. and G. Venturi, 1998. *Dye Plants: A Renewable Source of Natural Colours,* Pp: 27–30. Agro Food Industry Hi-Tech

TLL, 1997. *Cultivation and Extraction of Natural Dyes for Industrial Use in Natural Textile Production*. TLL (Thüringer Landesanstalt für Landwirtschaft), Project: AIR-CT94 - 0981

Turkish Standard Institute (TSI), 1978. *Turkish Standard No 717*. Colour fastness experiment methods for dyed or pressed textiles - determination of colour fastness according to abrasion, Ankara, Turkey

Turkish Standard Institute (TSI), 1978. *Turkish Standard No 399*. Colour fastness experiment methods for dyed or pressed textiles - Determination of Colour Fastness According to Water Spotting, Ankara, Turkey

Turkish Standard Institute (TSI), 1984. *Turkish Standard No 867*. Colour fastness experiment methods for dyed or pressed Textiles - Determination of Colour Fastness According to Sunlight, Ankara, Turkey

Turkish Standard Institute (TSI), 1984. *Turkish Standard No 423*. Methods of the using of the grey scale for sum up the staining (leaking of dye) and discolouring (changing of colour), for the determination of colour fastness values of textiles, Ankara, Turkey

Turkish Republic Ministry of Industry and Commerce, 1991. *Dyeing of Woollen Yarns with Dyes Obtained from Plants,* P: 167. Ankara, Turkey

Türkmen, N., S. Kırıcı, M. Özgüven, M. İnan and D.A. Kaya, 2004. An investigation of dye plants and their colourant substances in the eastern Mediterranean region of Turkey. *Botanical J. Linnean Soc.*, 146: 71–7

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