



Karyotype Analysis Of Fennel From Ankara Province

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Abstract

Fennel belongs to Apiaceae family is medicinal and aromatic species with economic importance rich essential oils. In this research; we try to obtain cytological parameters on Fennel. Six chromosomal parameters were measured by Micro Measure 3.3 program; i.e., chromosome length (c), relative length (RL), the long arm (L) and short arm (S) lengths, arm ratio (AR: L/S), centromeric index (S/C). Maximum chromosome length was measured 1.71 μm and max arm ratio was determined 2.79 μm . Relative length was ranged between 3.76-5.38%. Maximum centromeric index was measured in 1.81 μm . Karyotype formula were obtained $2n=2x= 8 \text{ median} + 4 \text{ submedian} (18 \text{ m} + 4 \text{ sm})$.

Keywords: Medicinal plant, plant cytogenetic, caryological characterization, chromosome

INTRODUCTION

The gene center of the genus *Foeniculum* is the Mediterranean basin and is represented in the world by three species. The species that have economic importance of the genus *Foeniculum vulgare* Mill. (Fennel). Fennel is a perennial, herbaceous plant, growing upright, reaching 2 m in length, with a filamentous piece of leaves and a yellow flowering plant. All parts of the plant can be evaluated, including seeds. It is a highly aromatic and flavourful herb with culinary and medicinal uses. Fennel seeds are anise (*Pimpinella anisum* L.) like in aroma and are used as flavour agents in baked goods, meat and fish dishes, ice cream, alcoholic beverages and herb mixtures [1, 2, 3].

Fennel is a widespread uses as medicinal plant because of various pharmacological activities. Also, it is believed to be one of the oldest medicinal plant in the World [4]. It is commonly used to treat amenorrhoea, angina, asthma, heartburn, high blood pressure a mild appetite suppressant and is used to improve the kidneys, spleen, liver and lungs. Fennel is also largely used for cattle condiments. It is one of the plants which is said to be disliked by fleas, and powdered Fennel has the effect of driving away fleas from kennels and stables. The plant gives off ozone most easily.

Fennel is well-recognized for its essential oil. The major components which are in fennel seed essential oils are trans-anethole, fenchone, estragol (methyl chavicol), and α -phellandrene and The relative concentration of these compounds varies considerably depending on the phenological stage and origin of the fennel [5]. Fennel has been reported to contain 6.3% of moisture, 9.5% protein, 10% fat, 13.4% minerals, 18.5% fibre and 42.3% carbohydrates. The minerals and vitamins in *F. vulgare* are calcium, potassium, sodium, iron, phosphorus, thiamine, riboflavin, niacin and vitamin C [6].

In general, there is a lack of cytogenetic report on Fennel in TURKEY. This paper provides cytogenetical knowledges about Fennel (*Foeniculum vulgare* Mill.) from Ankara, TURKEY

MATERIAL AND METHODS

Fennel seed were obtained from USDA (United States

Department Of Agriculture). It is presented in table 1.

All cytological observations were made from root tips. For visualizing somatic chromosomes, root tips were obtained from germinated fennel seeds germinated in petri

Table 1. Knowledges about Fennel

Group	Plant Name	Taxonomy	Origin
PI 117336	113	<i>Foeniculum vulgare</i> Mill.	Ankara-TURKEY

dishes at room temperature (25 °C). 2-3 days old root tips were pre-treated in 0.002 M 8 hydroxyquinoline in +4 °C for 2.5 hour then fixed in glacial acetic acid for 30 minutes and transferred to 70% ethanol for long storage. When the root tips were analyzed, they hydrolyzed with 1 N HCl for 12 minutes in room temperature (25 °C). After hydrolyzing, root tips stained with 2% aceto orcein in darkness for 2.5 h. Then, finally squashed in 45% acetic acid. Slides were observed with Olympus BX-51 microscope and photographs were taken with Olympus BX-51 camera, magnification was 8000x. Six chromosomal parameters were measured by Micro Measure 3.3 program [7]; i.e., chromosome length (c), relative length (RL), the long arm (L) and short arm (S) lengths, arm ratio (AR: L/S), centromeric index (S/C). Ideograms were drawn based on long arm length/short arm length. Karyotype formulas and chromosome positions of Fennel were determined by [8].

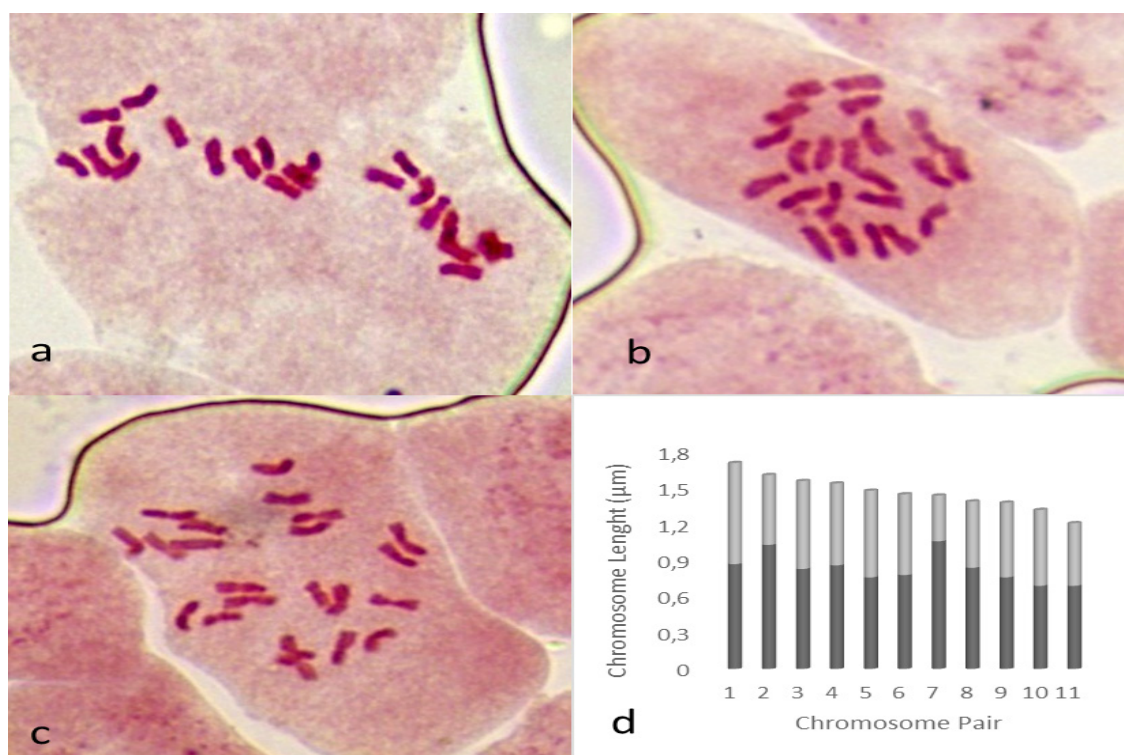
RESULTS and DISCUSSION

According to the cytologic studies that is carried out on the root tips of the fennel the number of somatic chromosome and the caryologic characteristics. It's found out that Fennel has the number of chromosomes as $2n=22$ and its karyotype formula has been measured as $18 \text{ median} + 4 \text{ submedian} (18 \text{ m} + 4 \text{ sm})$ (Figure 1). In reference to results, our findings are parallel to the other researchers findings [9, 10, 11]. As it is presented in table 1, the species who has a total chromosome length of 32.18 μm , the length of the chromosomes with haploid (n) numbers are within the range of 1.71-1.212

Table 2. Caryological features of Fennel

Chromosome Pair	C	L	S	R	RL	CI	C. P
1	1.71	0.87	0.84	1.04	5.38	1.81	m
2	1.61	1.03	0.58	1.78	5.01	1.14	sm
3	1.56	0.83	0.73	1.14	4.82	1.61	m
4	1.54	0.86	0.68	1.26	4.71	1.47	m
5	1.48	0.76	0.72	1.06	4.60	1.67	m
6	1.45	0.78	0.67	1.16	4.52	1.53	m
7	1.44	1.06	0.38	2.79	4.48	0.74	sm
8	1.39	0.84	0.55	1.53	4.32	1.20	m
9	1.38	0.76	0.62	1.23	4.26	1.44	m
10	1.32	0.69	0.63	1.10	4.13	1.54	m
11	1.22	0.69	0.52	1.33	3.76	1.27	m

Abbreviations: C, total chromosome length; L, long arm length; S, short arm length; R, arm ratio = L/S; RL, relative length; CI, centromeric index = $(S/C) \times 100$.; CP, centromeric position.

**Figure 1.** Somatic metaphase cells (a, b, c) and ideogram (d) of Fennel

μm and the average of the chromosome length has been measured $1.463 \mu\text{m}$. Relative length has been measured for the maximum level as 5.38% and for the minimum level as 3.76%. It's been observed that the long arm lengths of *fennel* are within the range of $1.06\text{-}0.69 \mu\text{m}$ and its short arm lengths are within range of $0.84\text{-}0.38 \mu\text{m}$. The arm ratio of the chromosomes have reached values between $2.79\text{-}1.04 \mu\text{m}$. When centrometric index has been observed, the chromosome number 1 had the highest value as 0.74 and the chromosome number 7 had the lowest value as 1.81.

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