

Effect of Different Organic Soil Amendments on Transplant Production of Fennel (*Foeniculum Vulgare* Mill)

Shahram Sharafzadeh and Omid Alizadeh

Islamic Azad University, Firoozabad Branch, Firoozabad, Iran.

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ABSTRACT

Fennel (*Foeniculum vulgare* Mill), belonging to Umbelliferae (Apiaceae) family, is a perennial plant. It is considered as a spice due to terpenic compounds isolated from its fruits. Successful transplant production begins with good growing media. Healthy vigorous transplants will be less susceptible to insects, diseases and transplant shock leading to better crop performance. The growing mixtures were using 1:1:1 (v/v) sand, soil and organic soil amendment. The treatments were (1) sand + soil + cocopeat, (2) sand + soil + sphagnum peat moss, (3) sand + soil + peat and (4) sand + soil + animal manure in a randomized complete block design with four replications. The highest values of shoot height (14.0 cm), shoot fresh weight (177.3 mg/plant), shoot dry weight (34.2 mg/plant), root fresh weight (21.8 mg/plant) and root dry weight (4.3 mg/plant) were at cocopeat amended medium which were not significantly different when compared to sphagnum peat moss treatment.

Key words: cocopeat, sphagnum peat moss, peat, animal manure, medicinal plants.

Introduction

Apiaceae (Umbelliferae) comprises about 455 genera and around 3750 species [15]. *Foeniculum vulgare* Mill (fennel), which belongs to this family is a perennial plant.

Botanically the seeds are defined as fruits [2,4]. Fennel is a cold-weather crop and grows well at altitudes of 2000 m. It can also be grown as a summer-season crop in temperate regions. Dry and cold weather favors increased seed production. The seeds may be sown in any good soil in shallow drills 45 cm apart. Fennel thrives well on well drained loamy to clay soils, which are rich in minerals and lime. However, heavy soils are more desirable than light soil for higher yield. When the plants are 7.5 to 10 cm high, they are thinned out to 30 cm apart. Other than occasional weeding and irrigation once a week, no further culture is required. In the plains sowing is done from October to November, and in

the hills it is done from March to May. Fennel grows well in the mild climates of India and thrives in the sunny, slimy, well-drained loams of Western India. Fennel requires frequent watering, with the frequency dependent on soil type and prevailing water conditions.

Because all the fruits do not mature together, harvesting of the umbels has to be done four to five times at a 10- to 15-day interval. The umbels are dried, separated, and cleaned by winnowing. On average, a grain yield of 500 to 900 kg per hectare can be obtained. Improved varieties can yield up to 1500 kg per hectare [11].

Fennel is considered as a spice due to terpenic compounds isolated from its fruits volatile oil [14]. Fennel is used in folk medicine as a stimulant, diuretic, carminative and sedative [6] and galactagogic, emmenagogic, expectorant and antispasmodic [7]. Antioxidant and antimicrobial activity of fennel has also been reported [16].

Corresponding Author

Shahram Sharafzadeh, Department of Agriculture, Islamic Azad University, Firoozabad Branch, Firoozabad, Iran.
Tel: +98-9177158317.
E-Mail: s.sharafzadeh@iauf.ac.ir or shahramsharafzadeh@hotmail.com

Fennel fruits are used to treat diseases like cholera bile disturbances, nervous disorder, constipation, dysentery and diarrhoea [12]. It is also used for control of diseases affecting chest, lungs spleen, kidneys and in colic pains [3]. Fennel oil is used as an expectorant component of cough remedies, and also as carminative component of stomach and bowel remedies [10,13]. Transplanting method of fennel gave 38% higher seed yield than direct seeding [18]. Successful transplant production begins with good growing media. Healthy vigorous transplants will be less susceptible to insects, diseases and transplant shock leading to better crop performance. Formulating growing mixes is especially challenging. Coconut coir dust or cocopeat is an agricultural by-product obtained after the extraction of fiber from the coconut husk. Cocopeat is considered as a good growing media component with acceptable pH, electrical conductivity and other chemical attributes [1]. Sphagnum peat moss and peat (represents an advanced stage of decomposition) are very common components in growing mixtures. Animal manure has the potential improvement in media physical properties and nutrient contribution. Scientific research on transplant production of fennel is limited. This study summarizes the effects of different organic soil amendments on fennel transplant production.

Materials and Methods

The study was conducted using the *Foeniculum vulgare* seeds in the experimental greenhouse of Islamic Azad University, Firoozabad Branch, Iran (28°35' N, 52°40' E; 1327 m above sea level). The growing mixtures were using 1:1:1 (v/v) sand, soil and organic soil amendment. The treatments were (1) sand + soil + cocopeat, (2) sand + soil + sphagnum peat moss, (3) sand + soil + peat and (4) sand + soil + animal manure.

Properties of the organic soil amendments used in the growing mixtures have been shown in Table 1.

The experiment was carried out in a randomized complete block design with four replications. Each replication included one pot containing 30 plants. During the experimental period, seedlings were watered daily.

After 30 days, 10 plants were randomly selected from each replication and Shoot height, shoot fresh and dry weights and root fresh and dry weights were measured.

Data from the experiment were subjected to analysis of variance (ANOVA) using Statistical Analysis System (SAS) computer software at $P < 0.05$ and means compared with Duncan's new multiple range test (DNMRT).

Table 1: Properties of the organic soil amendments used in the growing mixtures.

Organic amendment	EC (dS m ⁻¹)	pH	N (%)	P (%)	K (%)
Cocopeat	0.50	6.3	0.42	0.07	2.18
Sphagnum peat moss	0.55	4.0	0.40	0.02	0.05
Peat	1.40	7.2	1.18	0.11	0.15
Animal manure	8.00	8.2	1.80	0.35	2.25

Results and discussion

Growth of fennel transplants was affected by kind of the organic soil amendments applied in growing media (Table 2).

The highest values of shoot height (14.0 cm), shoot fresh weight (177.3 mg/plant), shoot dry weight (34.2 mg/plant), root fresh weight (21.8 mg/plant) and root dry weight (4.3 mg/plant) were at cocopeat amended medium which were not significantly different when compared to sphagnum peat moss treatment.

Animal manure and peat decreased growth of the transplants when compared to cocopeat and sphagnum peat moss.

Cocopeat and sphagnum peat moss have acceptable EC that is an important property of any growing media as this parameter indicate inherent nutrient status in the media. Another important attribute of sphagnum peat moss is that it reduces the pH of medium to which it is added as this parameter directly influenced the availability of nutrients.

It is possible that the apparent reduction in growth of vegetable transplants in high amounts of animal manure be due to high salinity conditions or poor aeration [5,8,17]. Lettuce has also been found to be sensitive to high rates of animal manure [9]. In conclusion, fennel transplants produced with cocopeat and sphagnum peat moss amended medium had the best quality.

Table 2: Effect of growing mixtures on growth of fennel transplants.

Growing mixtures (1:1:1)	Shoot height (cm)	Shoot FW (mg)	Shoot DW (mg)	Root FW (mg)	Root DW (mg)
Sand + soil + cocopeat	14.0a ¹	177.3a	34.2a	21.8a	4.3a
Sand + soil + sphagnum peat moss	13.5a	161.5a	34.1a	21.3a	3.7a
Sand + soil + peat	12.5b	132.5b	26.6b	15.5b	2.9b
Sand + soil + animal manure	11.3c	126.5b	26.5b	13.0b	2.7b

¹In each column, means with the same letters are not significantly different at 5% level of Duncan's new multiple range test.

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