

Fennel Transplant Production in Animal Manure-amended Mixture

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ABSTRACT

Fennel (*Foeniculum vulgare* Mill), which belongs to Apiaceae (Umbelliferae) family is a perennial plant. The essential oil of fennel is used to flavor different food preparations and in medicine and perfumery industries. Healthy vigorous transplants will be less susceptible to insects, diseases and transplant shock leading to better crop performance. Formulating growing mixes is especially challenging. Animal manure has a high mineral nutrient content. An experiment was conducted in a randomized complete block design with four replications to evaluate the effect of animal manure rate on growth of fennel transplants. The maximum of shoot fresh weight (164.0 mg/plant), shoot dry weight (37.5 mg/plant), root fresh weight (22.8 mg/plant) and root dry weight (4.4 mg/plant) were observed at 10% animal manure.

Key words: medicinal plants, *Foeniculum vulgare*, growing mixture, animal manure.

Introduction

Fennel (*Foeniculum vulgare* Mill), which belongs to Apiaceae (Umbelliferae) family is a perennial plant. 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 [12].

Fennel fruits (seeds) are widely used in the preparation of various dishes like soups, sauces, pastries, confectioneries, pickles and meat dishes etc. The leaf stalks and the tender shoots are also used in salads. Fennel is used in cooking for liqueurs [3]. The essential oil of fennel is used to flavor different food preparations and in perfumery industries.

The oil, which contains components such as anethole and fenchone has important role in pharmaceutical and other industries such as confectionery [1]. Fennel is used in medicine as a stimulant, antispasmodic, emmenagogic, diuretic, carminative, sedative, galactagogic and expectorant [6,7,19].

Antioxidant and antimicrobial activity of fennel has also been reported [17]. The present Ayurvedic pharmacopoeia recommends it in dried fruit or fluid extract form, for flatulent dyspepsia, anorexia, and flatulent colic in children [11].

In some country, it is also used as a component of galactagogue preparations [14]. It is still widely used in traditional Arabian medicine as diuretic appetiser and digestive [11].

Organic vegetable growers are increasingly faced with reduced supply and poor quality transplants. Vegetable transplants produced organically are often of low quality because of poor fertilization management. There is limited information available on fertilization of organic production of vegetable transplants.

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A major challenge in organic production is the uncertainties in bio-availability of macro and micro nutrients contained in organic fertilizers or amendments. In most instances the essential nutrients are in unavailable forms or need to be chemically modified to be available to plants. Thus, it is usually difficult to determine optimum application rates of organic fertilizers based only on the chemical composition of organic amendments [8]. Transplant production using organic media reported in some studies [4,8,16] but scientific research on transplant production of fennel is limited.

Animal manure has a high mineral nutrient content. The objective of this study was to determine the effect of animal manure rate on growth of fennel transplants.

Materials and methods

The study was conducted using the fennel seeds in the experimental greenhouse of Islamic Azad University, Firoozabad Branch, Iran (28°35' N, 52°40' E; 1327 m above sea level). Fennel transplants were grown in a mixture of sand and soil in a 1:1 ratio (v:v) amended with different rates of animal manure. The treatments were 10%, 15%, 20% and 25% (by volume) animal manure. The animal manure used in the growing mixtures had 1.8% N, 0.35% P, 2.25% K with pH=8.2 and EC=8 dS.m⁻¹. The experiment was carried out in a randomized complete block design with four replications. Each replication included one pot containing 30 plants. Seedlings received no additional fertilizer. During the experimental period, seedlings were watered daily. After 30 days, ten 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).

Results and discussion

Fennel transplants were influenced by the rate of animal manure applied in growing media (Table 1). The maximum of shoot fresh weight (164.0 mg/plant), shoot dry weight (37.5 mg/plant), root fresh weight (22.8 mg/plant) and root dry weight (4.4 mg/plant) were observed at 10% animal manure. The growth of transplants decreased in 20% and 25% animal manure amended-mixtures.

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 [5,8,18]. Hendawy *et al.* [10] showed some benefits of organic matter application: Recently, a great attention was paid towards the application of bio-organic farming to avoid the heavy use of agrochemical that resulted in numerous of environmental troubles [13]. The coincident application of organic manures and biofertilizers is frequently recommended for improving soil properties and obtaining clean agricultural products [9]. Proponents of organic agriculture have asserted that plant grown with biological sources of nutrients such as manure and composted organic waste are less susceptible to insects than conventionally grown plants [15].

Moreover, organic matter plays an important role in the chemical behavior of several metals in soils throughout its active group (flavonic and humic acids) which have the ability to retain the metal in complex and chelate forms [2].

Table 1: Effect of animal manure rate on growth of fennel transplants.

Animal manure rate (%)	Shoot height (cm)	Shoot FW (mg)	Shoot DW (mg)	Root FW (mg)	Root DW (mg)
10	11.3a ¹	164.0a	37.5a	22.8a	4.4a
15	11.8a	146.3b	33.3b	18.5b	4.0a
20	11.3a	126.0c	28.3c	16.0bc	2.9b
25	10.9a	131.3bc	30.0c	13.5c	2.8b

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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