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Effects of different growing media on growth of *Cardopatium corymbosum* (L.) Pers. (Asteraceae)

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Abstract

This study was conducted to determine the effect of different growing media on the growth of *Cardopatium corymbosum* (L.) Pers. The pot experiments were carried out with plants which are obtained from germination studies and from field and the effect of different applications on leaf number and leaf size was determined. The maximum leaf number change was observed at 200 ppm GA_3 at 90 days and maximum leaf size change was observed in liquid nutrient medium at 60 days on plants which was obtained at germination experiment. The maximum leaf number change was determined in the application of 200 ppm GA_3 at 60 days and the maximum change in the leaf size was determined in the field soil + 10% vermicompost experiment at 60 days on plants which was obtained from experiment field.

Key words: *Cardopatium corymbosum,* GA_3, germination, growing media, vermicompost.

1. Introduction

The member of the Asteraceae family has numerous pharmacological effects such as plant, antifungal, antibacterial, antitumor, antihelminthic, antifungal and antiinflammatory. *C. corymbosum* (L.) Pers. has medical potential. It has been reported in ethnobotanical studies that this species have antiseptic and antihelminthic effect and used in wound healing (Pieroni et al., 2006; Bulut et al., 2017; Kahya, 2017). In this study, it was aimed to investigate the effect of different growing media on the growth of *C. corymbosum*.

Population growth has made it necessary to obtain more efficiency from the unit area. In today's conditions where pressure on agricultural areas is increasing, new approaches in production are getting more and more important day by day (Çıtak et al., 2011).

Since the 1980s, soilles cultivation techniques have come to the forefront and crop yield has been relieved from dependence on soil; because of soil salinity, soil-borne diseases and pests, lime, low soil quality, high and low soil temperature factors are obstacles to obtaining yield from cultivation. In the soilless cultivation, peat, compost, coconut, burnt rice bark, tree bark, etc. uses as organic medium and perlite, sand, vermiculite, rock wool, glass wool, zeolite, volcanic tuff etc. uses as inorganic medium (Güneş et al., 2012; Hazar and Baktır, 2013).

In our study, we have tried different combinations of sheep manure and vermicompost with peat and perlite growing media.

2. Materials and Methods

The effect of different growing media on *Cardopatium corymbosum* was investigated in our study. Our experiments were carried out as a pot experiment. In addition, as plant material, healthy plants we obtained in the experiment of germination and plants with root taken from the field were used. The experiment was carried out as 6 replication.

Plants potted to pre-prepared mixture on 08.04.2017. The experiments were carried out for 3 months and ended on 08.07.2017. In addition, the plants were transplanting to green house on 11.06.2017.

The content of the pre-prepared mixture is as follows: 30% perlite mixed imported peat, pH setting: 5,5-6,5, Peat thickness: 0-6 mm, Organic matter: 95%, Extra NPK added, Black peat: 50% white peat: 50%. Sphagnum peat's content is as follows: Humus:42-55 g/l, Weight: 200 kg/m^3, EC: Maximum 0,3, pH: 5,5-6,5, Lime: 3 kg/m^3, Calcium and magnesium: 2 kg/m^3, Surface active agent: 0,1 kg / m^3.

The different growing media used in the pot experiment in which germinated seeds are used are as follows: 1) 10% vermicompost + 200 ppm GA_3, 2) Only 10% vermicompost, 3) 10% sheep manure + 200 ppm GA_3, 4) Only 10% sheep manure, 5) Only 200 ppm GA_3, 6) Liquid fertilizer, 7) Control.

Slowverts liquid nutrient was used as liquid fertilizer and its contents are: NPK 2: 2: 2, Total Nitrogen: 2% (Nitrate nitrogen (NO_3): 1%, Ammonia nitrogen (NH_3): 1%), Water

soluble Phosphorus Pentaoxide (P_2O_5): 2%, Water soluble potassium (K_2O): 2%, pH range: 4-8.

The growing media used in the plants taken from the field are as follows: 1) Only 10% vermicompost, 2) 10% vermicompost + 200 ppm GA_3, 3) Only 10% sheep manure, 4) Only 200 ppm GA_3, 5) plants are grown in the peat + 10% vermicompost, 6) field soil + 10% vermicompost, 7) Control.

The content of Mixflor peat used in this study is as follows: pH range: 5.5-6.8, EC (μS/cm): 22, Organic matter (%): 54-60, Humidity (% water retention capacity: 575.03, purity: 95%).

The results of field soil analysis are as follows: Saturation (%) : 40.4, Salinity (dS/m): 0.31, pH: 8.07, Lime (%) : 2.4, Organic matter (%) : 0.53, Nitrogen (%): 0.03, Phosphorus: 306.31 ppm, Calcium: 2399 ppm, Magnesium: 421.9 ppm, Sodium: 601.8 ppm, Iron: 14.14 ppm, Copper: 0.97 ppm, Manganese: 7.58 ppm, Zinc: 0.21 ppm.

3. Results

The effect of different growing media on seedling growth was investigated in the experiment. At the 30th day, the highest number of leaves was obtained in the application of liquid nutrients in the flower pot experiment in which the plant samples that we germinated were used as plant material. The highest number of leaves at 60th and 90th day occurred only at 200 ppm GA_3 application. The least number of leaves was observed in 10% vermicompost application. In the applications of vermicompost + GA_3, only vermicompost and only liquid fertilizer occurred losses between 60th day and 90th day (Table 1).

Table 1. Comparison of the effect of different growing applications on number of leaves in the germinated plants.

Applications	Number of leaves (average)						
	Planting	30th day	Change (%)	60th day	Change (%)	90th day	Change (%)
Vermicompost +GA_3	6.33	8.33	31.60	13.33	110.60	7.40	16.90
Vermicompost	5.33	5.66	6.20	7.83	46.90	5.40	1.30
Sheep manure + GA_3	5.83	7.66	31.40	11.80	102.40	12.80	130.80
Sheep manure	5.00	6.16	23.20	8.66	73.20	8.83	76.60
GA_3	5.00	7.00	40.00	11.83	**136.60**	12.00	**140.00**
Liquid fertilizer	4.00	6.10	**52.50**	7.10	77.50	6.60	65.00
Control	5.33	7.83	46.90	8.00	50.10	9.50	78.20

* Change (%): the percentage of difference that occurs by sowing on the 30th, 60th and 90th days after planting.

When the effect of different applications on the leaf size was examined, it was determined that the best application at 30 and 90 days was 200 ppm GA_3 application. On the 60th day, the maximum leaf size average change was obtained in liquid nutrient application. At 30th day, the change in the average leaf size was observed at least in 10% vermicompost, 10% sheep manure at 60th day and 10% vermicompost + 200 ppm GA_3 at 90th day (Table 2).

Table 2: Comparison of the effect of different growing applications on size of leaves in the germinated plants.

Applications	Size of leaves (average) cm						
	Planting	30th day	Change (%)	60th day	Change (%)	90th day	Change (%)
Vermicompost+GA_3	2.83	6.04	113.43	6.86	142.40	4.98	75.97
Vermicompost	2.93	3.66	24.91	6.62	125.94	5.64	92.49
Sheep manure+GA_3	2.82	5.89	108.87	6.48	129.79	6.23	120.92
Sheep manure	2.72	5.24	92.65	6.11	124.63	5.93	118.01
GA_3	2.83	7.01	**147.70**	8.27	192.23	7.76	**174.20**
Liquid fertilizer	2.18	4.72	116.51	7.40	**239.45**	5.23	139.91
Control	2.13	3.90	83.10	6.91	224.41	5.72	168.54

The effects of different growing applications on number of leaves were investigated in the samples taken from the field and it was determined that the number of leaves was changed more than the other applications in GA_3 application at 30th and 60th days. On the 90th day, the application of sheep manure + GA_3 gave better results. In addition, it has been determined that the number of leaves is lower than peat + vermicompost and field soil + vermicompost. In the other applications except sheep manure + GA_3, only sheep manure and control group, leaf number average decreased in 90th day compared to 60th day (Table 3).

Table 3: Comparison of the effect of different growing applications on number of leaves in the field samples.

Applications	Number of leaves (average)						
	Planting	30th day	Change (%)	60th day	Change (%)	90th day	Change (%)
Vermicompost+GA_3	7.00	8.33	19.00	13.00	85.7	10.00	42.80
Vermicompost	5.66	7.50	32.50	11.83	109.00	8.00	41.30
Sheep manure+GA_3	6.00	8.33	38.80	12.16	102.7	15.83	**163.80**
Sheep manure	6.16	7.66	24.40	11.83	92.00	13.00	111.00
GA_3	6.50	10.33	**58.90**	17.33	**166.60**	14.25	119.20
Peat + vermicompost	6.00	7.40	23.30	7.60	26.70	5.75	- 4.20
Field soil+vermicompost	4.4	5.22	18.60	4.55	3.40	3.77	- 14.30
Control	4.83	6.33	31.00	7.83	62.10	8.50	76.00

It was observed that the application of sheep manure + GA_3 at the 30th day was the best in the pot experiment in order to determine the effect of different cultivation practices on the leaf size in the samples taken from the field. Soil taken from field + vermicompost at 60th day and peat + vermicompost at 90th day showed the highest average leaf size. It is also seen that in other applications except peat + vermicompost and field soil + vermicompost applications, the average leaf size is less at 90th day than planting (Table 4).

Table 4: Comparison of the effect of different growing applications on size of leaves in the field samples.

Applications	Size of leaves (average) cm						
	Planting	30th day	Change (%)	60th day	Change (%)	90th day	Change (%)
Vermicompost+GA_3	7.95	10.63	33.71	9.37	17.86	4.70	-40.88
Vermicompost	9.05	8.88	-1.88	9.76	7.85	6.93	-23.43
Sheep manure+GA_3	8.05	12.13	**50.68**	10.01	24.35	6.46	-19.75
Sheep manure	8.54	11.51	34.78	10.67	24.94	6.66	-22.01
GA_3	7.91	9.47	19.72	8.56	8.22	7.11	-10.11
Peat+vermicompost	7.86	8.8	11.96	10.54	34.10	10.91	**38.80**
Field soil+vermicompost	4.29	6.12	42.66	7.41	**72.73**	5.45	27.04
Control	8.19	9.62	17.46	10.45	27.59	7.64	-6.72

It has been reported that gibberellin encourage to produce flowering in the plants (Taiz and Zeiger, 2008). Flower formation was observed in pot experiments with plants which

collected from field and containing 10% sheep manure + 200 ppm gibberellic acid. A few examples of the pot experiment using the germinated seeds are given in Figure 1-2.

Figure 1. Pot experiment which conducted with germinated seeds (09.04.2017).

Figure 2. Pot experiment which conducted with germinated seeds (11.06.2017).

A few examples of the pot experiment using the plants collected from field are given in Figure 3-4.

Figure 3. Pot experiment which conducted with plants collected from field (09.04.2017).

Figure 4. Pot experiment which conducted with plants collected from field (11.06.2017).

It was determined that the maximum number of leaves obtained in vermicompost+ gibberellic acid, only vemicompost and liquid fertilizer applications at 60th day. It was showed that maximum number of leaves obtained in sheep manure + gibberellic acid, only sheep manure, only gibberellic acid and control applications at 90th day (Figure 5). The highest leaf size was obtained at 60 days in all treatments (Figure 6).

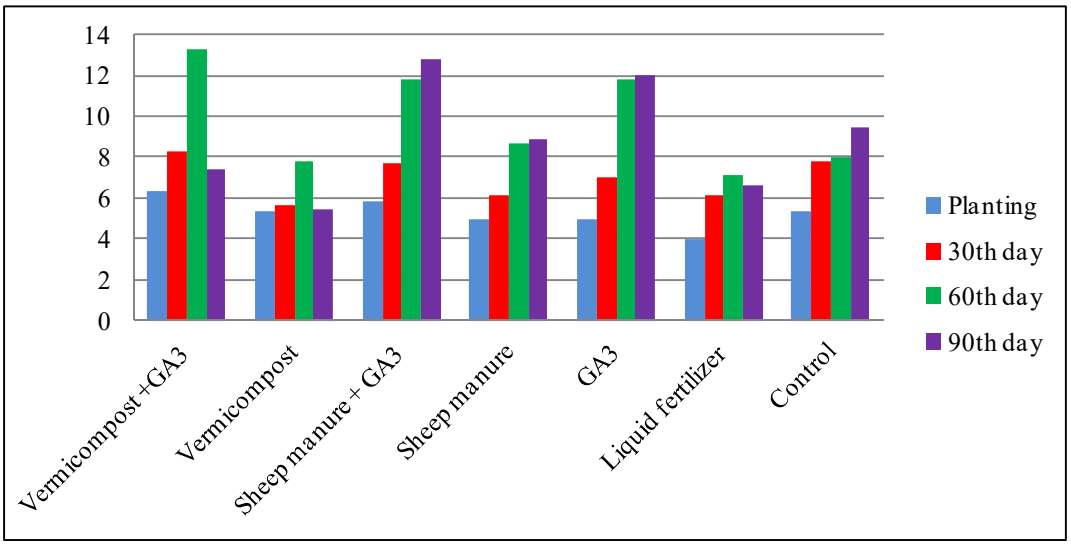

Figure 5. The effect of different applications on number of leaves in germinated seeds.

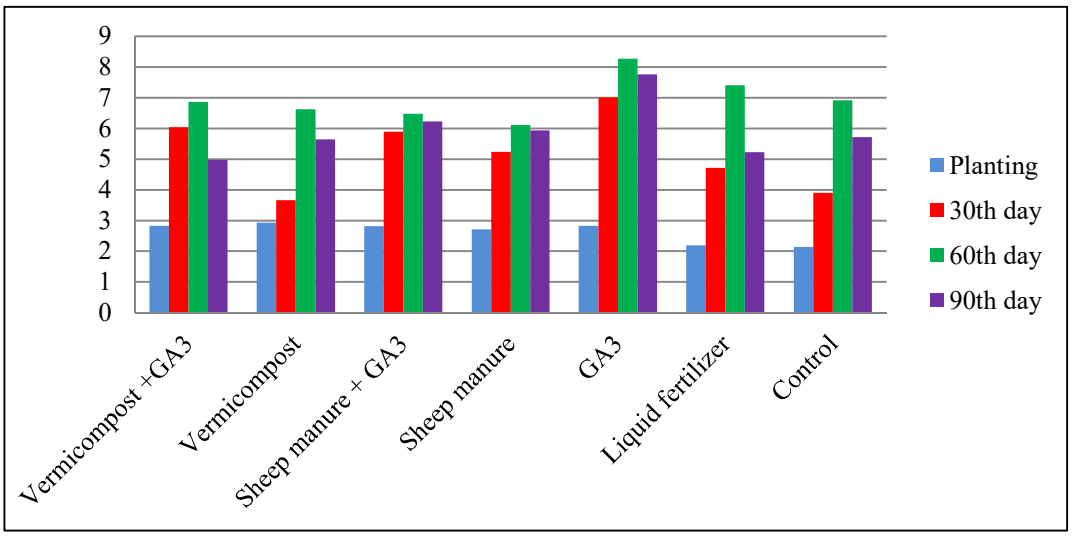

Figure 6. The effect of different applications on size of leaves in germinated seeds.

When we examined the effect of different applications on leaf number, the maximum number of leaves obtained in vermicompost + gibberellic acid, only vermicompost, only gibberellic acid and peat + vermicompost applications at 60th day. The highest number of leaves was observed on the 90th day in sheep manure + gibberellic acid, only sheep manure

and control applications. The maximum leaf number was observed in field soil + vermicompost application at 30th day (Figure 7).

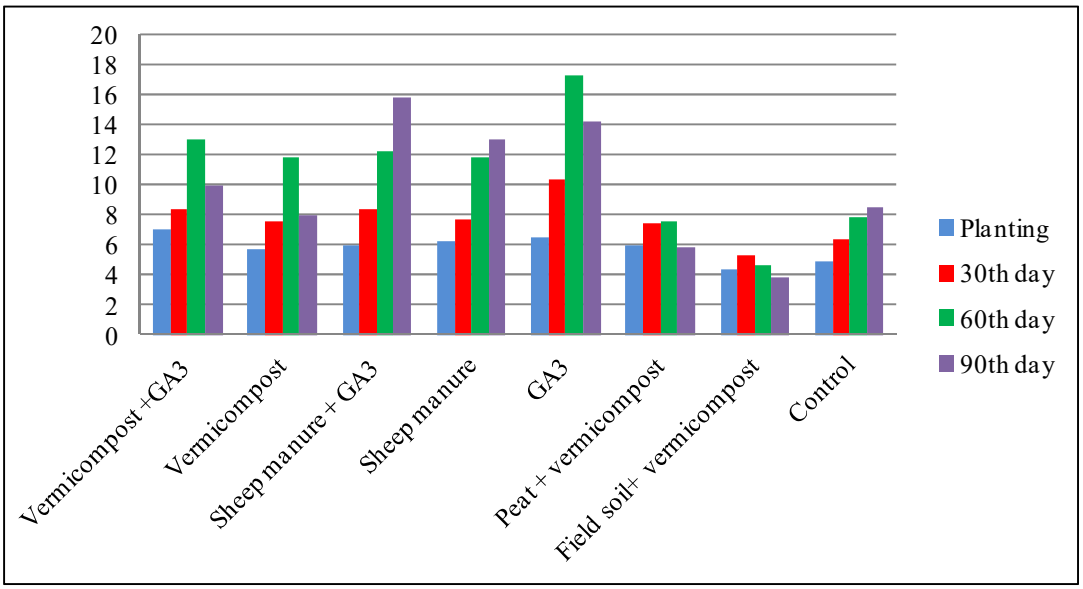

Figure 7. The effect of different applications on number of leaves in plants with root.

In the samples taken from the field, the maximum leaf size obtained in vermicompost + gibberellic acid, sheep manure + gibberellic acid, only sheep manure and only gibberellic acid applications at 30th day. The highest leaf showed in field soil + vermicompost and control applications at 60th day, in addition to this, the maximum leaf size observed in peat + vermicompost application at 90th day (Figure 8).

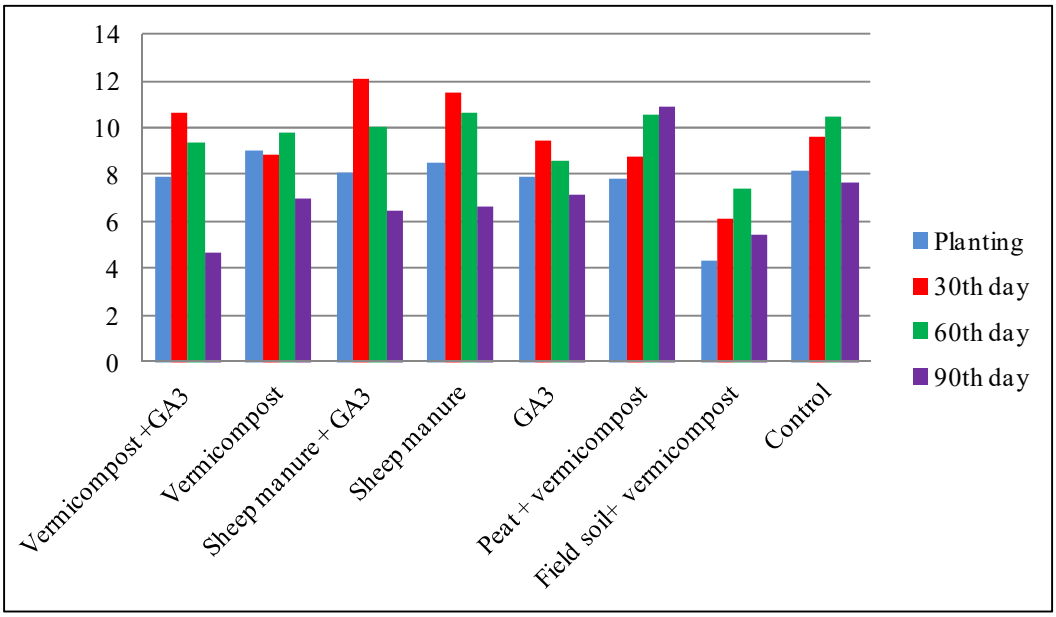

Figure 8. The effect of different applications on size of leaves in plants with root.

4. Discussion

No other studies have been found in the cultivation of *Cardopatium corymbosum* (L.) Pers. Therefore, we will try to compare our results with some plants in the same family.

In this study, we observed that gibberellic acid has the best effect and vermicompost has the least effect on leaf lenght and leaf number. However, the effect of vermicompost on the leaf length of the plants which taken from the field was better than the other treatments. In a research conducted by Sardoei (2014) reported that 30 and 40% commercial medium with vermicompost provided the best vegetative growth in *Calendula officinalis* (L.). In addition to, this research showed that the largest height of plant were obtained in 20% vermicompost. However, it stated that vermicompost increased bud fomation, plant height and number of flowers (Sangwan et al., 2010).

In another study (Hadi et al., 2011) indicated that the highest plant height and the largest flower head diameter in *Matricaria chamomilla* (L.) was obtained in 20 ton vermicompost per hectare. Flower formation observed at 10% sheep manure + 200 ppm gibberellic acid in our research. In the research which was conducted by Hasan et al. (2014), the effect of peat moss and sheep manure on the growth and flowering of *Calendula officinalis* (L.) was investigated and it was stated that sheep manure increased the number of leaves to control and good results were obtained in terms of flower diameter. In our study, the effect of sheep manure on the number of leaves is also generally better than the control.

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