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Effect of Seed Storage Duration and Seedling Raising method on Chamomile Seedling Establishment

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ABSTRACT

Objective: Chamomile is one of the commercial medicinal plants produced in Ethiopia. Besides, it is priority crop in national aromatic and medicinal plants research project in the country. As chamomile production affected by production techniques this activity was conducted to identify the effect of seed storage duration and seedling raising methods on its seedling establishment. **Methods:** The experiment was conducted during 2015 at rain feed condition at wondogenet agricultural research center, south Ethiopia using randomized complete block design in three replications. Zero months, three month, six month, nine month and twelve month stored seeds were combined with direct sowing, seed bed raised and pot raised seedlings resulting in a total of fifteen treatments. Data on plant height, flower yield per plant, flower yield per hectare, number of flower per plant and average weight of ten flowers were collected and tested statistically. **Results:** Direct sowing and pot raised methods resulted in lowest and highest value in all parameters respectively. Least and largest values range from 35.37 to 60.08 for plant height, 43.88 to 51.77 for flower yield per plant, 4.87 to 5.74 for flower yield per hectare, 244.99 to 383.71 for number flower per plant and ranges from 1.51 to 1.57 for average 10 flower weight. One year old seedlings resulted in higher mean value for plant height, flower yield per plant, flower yield per hectare and average weight of 10 flowers. Zero month treatment resulted in the least values for flower yield per plant, flower yield per hectare and number of flower per plant parameters. However, even though seedling raising method resulted in very highly significant results in plant height and in number of flower per plant, in all seed storage durations treatments there was none significance results for all testing parameters. Besides, the interaction of seed storage duration and seedling raising method treatments were resulted in none significant result for all testing parameters.

Introduction

Chamomile (*Matricaria chamomile L.)* is an annual plant belongs to Asteraceae (Compositae) family. It is cultivated for flowers which have medicinal properties and are used to make herbal products and essential oil. Chamomile is one of the important aromatic and medicinal plants widely cultivated and used in the world. In Ethiopia performance of two chamomiles, American and German types were evaluated for agronomic and chemical traits and according to (Beemnet, 2015) it is possible to use both cultivars for the production of herbal flowers and essential oil yield in the country.

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Chamomile is mostly cultivated by using seeds. However, maintaining seed viability for long period is very critical as many factors lower seed germination, deteriorate and cause loss of viability. Temperature, nature of the seeds, seed moisture content, and relative humidity influence the seed longevity during storage. Increment in temperature as well as moisture can cause fungal growth which reduces seed viability. Hence, proper storage conditions may effectively retain substantial viability in seeds over a considerable storage period. (Croft, 2012) suggested that germination of seed is afunction of duration of storage, storage temperature and moisture at storage. Another finding on moringa seed storage duration determination also reported that storage temperature and storage duration has an interaction effect on the germination percentages of its seeds (Mubvuma, 2013.) which argue with the findings that increasing storage duration resulted higher reduction in germination characteristics of swertia chirayita, medicinal plant in Himalaya (Pradhan, 2012) and *Periploca angustifolia L*. seed vialbility decreased with increase in storage period (Abdellaoui, 2013). Besides, best technique of crop propagation has to be identified before cultivation practices. Chamomile can be propagated by using seeds which can either sown directly or used to prepare seedlings at nursery. Direct sowing as well as transplanting has its own merits and demerits. For instance, transplanting is advantageous in lowering weeding costs and other pest issue that occur with germinating seeds in field. If we use the transplanting method rather than the direct seeding method for crop establishment, we need to produce seedlings selecting proper seedling raising method. Seedling can be raised by using bare bed, polythene containers (pot) and germination trays. As seed storage duration and seedling raising methods affect crop germination and its productivity identification of proper period for storage and best method for seedling production is critical. Hence, the object of this experiment was to determine the effect of seed storage duration and seedling raising method on chamomile seedling establishment.

Materials and Methods

American type Chamomile (*Matricaria chamomile* L.) maintained at wondogenet agricultural research center was used for testing effect of seed storage duration and seedling raising methods for optimum seedling establishment during 2015 using randomized complete block design in three replications. Five storage durations (freshly harvested, 3, 6, 9 and 12 month old) and three seedling raising methods (pot raised, direct sown, and seed bed raised seedlings) were tested. Seeding/planting/ was performed in a spacing of 30 cm between rows and plants on the experimental plot having area of 6.4 m2 with 3.6 m length and 1.8 m width. All agronomic practices were performed as required. No fertilizer and chemical was applied during evaluation. Five samples were taken from each plot for data recording and analysis. Data on plant height (cm), flower yield/plant (g), flower yield/ha (kg), number of flower per plant and average weight of 10 flowers were collected and statistically analyzed by analysis of variance using SAS software at $P< 0.05$.

Result and Discussion

Seedling raising method has very highly significant ($P < 0.001$) effect on plant height and number of flower per plant. Pot raised seedlings resulted in higher mean value in all testing parameters and direct sowing resulted in least mean values for plant height, flower yield per plant, flower yield per hectare and number of flower per plant(table 1). Both seed storage duration treatments and their interaction with seedlings raising method resulted in none significant results in agronomic traits of chamomile. Freshly harvested seeds and seeds stored for 12 months resulted none significant results except for number of flower per plant. Mao (2009) suggested that germination rates of zoysia grass seed decreased significantly ($P < 0.05$) as the storage period prolonged from 6 to 18 months, with moderate declines in seeds harvested at the hard stage. This indicated the possibility to use longer storage periods for further investigations.

Table1. Plant height, flower yield per plant, flower yield per hectare, number of flower per plant and average weight of 10 flowers as affected by seedling raising methods and seed storage duration.

Treatment	PH	FYPP	FYPH	NFPP	AW10F
SRM					
Pot	60.08a	51.77a	5.74a	383.71a	1.57a
Seed bed	41.41b	48.17ab	5.34ab	278.25b	1.45b
Direct sowing	35.37c	43.88b	4.87b	244.99b	1.51ab
LSD (0.05)	4.41	5.92	0.66	39.92	0.12
SSD(month)					
0	45.36a	44.2a	4.9a	266.84b	1.51a
3	44.89a	49.3a	5.45a	301.4ab	1.57a

6	43.2a	45.87a	5.08a	292.4ab	1.53a
9	47.29a	49.86a	5.53a	330.36a	1.48a
12	47.39a	50.51a	5.60a	320.58a	1.46a
LSD (0.05)	5.69	7.65	0.85	51.54	0.15

SRM= seedling raising methods, SSD= seed storage duration

Table2. Mean squares of agronomic traits of chamomile as affected by seed storage duration and seedling raising methods.

Source	DF	PH	FYPP	FYPH	NFPP	AW10F
rep	2	0.62	93.32	1.15	5603.44	0.0012
RM	2	2488.36***	234.63ns	2.88ns	78675.78***	0.060ns
SD	4	27.75ns	68.39ns	0.84ns	5573.49ns	0.020ns
RM*SD	8	50.84ns	48.60ns	0.60ns	1602.41ns	0.020ns
Error	28	34.76	62.74	0.77	2848.48	0.027
CV%		12.92	16.52	16.52	17.65	10.89

*=significant at P < 0.05 level; **= highly significant at P < 0.01 level; ***=very highly significant at p<0.001, ns= non significant at P< 0.05 level, PH=plant height (cm), FYPP=flower yield per plant (g), FYPH=flower yield per hectare, NFPP=number of flower per plant, AW10F= average weight of 10 flowers.

Conclusion

Pot raised seedlings resulted in higher mean value in all testing parameters. However, further research should be done to determine effect of seed storage duration using chamomile seeds stored more than a year.

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