



Seedling Vigour of Garland Chrysanthemum (*Chrysanthemum coronarium* L.)

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ABSTRACT

Garland chrysanthemum was found next only to African marigold with respect to total number of seeds germinated. The crop showed maximum number of seeds germinated on 4th day which decreased to minimum on 6th day of study. Laboratory studies revealed that garland chrysanthemum was highly vigorous with respect to germination and seedling vigour. It was next only to Africa marigold in seedling length, seedling vigour index and seedling dry weight on 7th day of study. The seedling length after 25 days of sowing in garland chrysanthemum was found less as compared to other annuals but its the growth rate picked up after transplanting and thus recording better plant height at 45 days after transplanting as compared with other annuals.

Key words : Charysanthemum, Garland, Seedling vigour .

Garland chrysanthemum (*Chrysanthemum coronarium* L.) is a new crop added to the list of flowering annuals suited to Indian conditions. It is of short duration and less photosensitive crop capable of coming up in all seasons under Dharwad conditions. On account of its capacity to set viable seed, the crop is normally seed propagated. Hence, it is felt that there is a need to analyse the vigour of these seeds in comparison with those of other flowering annuals in order to understand its position among them. Although numerous seed vigor tests were developed, five major ones are used by most seed analysts. These include accelerated aging, cold test, cool test, electrolyte leakage and seedling growth rate (Hartmann *et al.*, 1997). In the present study seedling vigor of garland chrysanthemum has been studied in relation to different flowering annuals.

MATERIAL AND METHODS

The present study was conducted at Main Agricultural Research Station, Dharwad with eight flowering annuals, *viz.* china aster, marigold, gaillardia, cosmea, zinnia, sunflower, ageratum and garland chrysanthemum. Twenty seeds per species were sown in 8.5-cm-diameter plastic petri dishes containing filter paper.

Seeds were sown in well prepared nursery beds of 2.5 m² each. In each seed bed three patches of 30 cm² were selected. Observations on stem

length, root length were recorded on ten randomly selected seedlings from each of these patches.

The seedling vigour index was calculated by multiplying the germination percentage with seedling length and then divided by 100 (Abdul Baki and Anderson, 1973). Germination Rate Index was calculated by summing up the fractions of number of seeds germinated upon the day number over the test period (Balachandra, 2001).

RESULTS AND DISCUSSION

Laboratory studies

Significant differences existed among the different flowering annuals studied with respect to the total number of seeds germinated, germination rate index (GRI), per cent germination, shoot length, root length, seedling length, seedling vigour index and the seedling dry weight at the end of test period. Maximum number of seeds (18) were germinated in the species china aster and marigold, while minimum number of seeds germinated in the species ageratum (14) followed by gaillardia (15). Maximum GRI (12.6) was recorded by african marigold which was on par with garland chrysanthemum (11.97), while minimum GRI (9.5) was recorded by gaillardia which was at par with ageratum (9.96).

Maximum germination percentage (89) was recorded by African marigold which was on par with china aster (88.5), garland chrysanthemum

(87) and ornamental sun flower (83), while minimum percentage of germination (69.33) was recorded by *ageratum* which was at par with *gaillardia* (75). Maximum shoot length (4.15 cm) was recorded by African marigold which was significantly different from the shoots of *ageratum* in length (2.16 cm). Maximum root length (2.70 cm) was recorded by African marigold which was on par with garland chrysanthemum (1.85 cm) and *zinnia* (1.80 cm) but, significantly different from the *cosmea* (1.64 cm)

The highest seedling length was recorded (6.85 cm) by African marigold which was on par with garland chrysanthemum (5.9 cm), *cosmea* (5.57 cm), *zinnia* (5.48 cm) and china aster (5.45 cm). The highest seedling vigour index (609.65) was recorded by African marigold, which was on par with garland chrysanthemum (513.3), china aster (482.33), *zinnia* (449.36) and *cosmea* (440.03). The differences noticed among the various flowering annuals with respect to seedling dry weight were found to be significant. Maximum dry weight of seedling (10.28 mg) was recorded by African marigold, which was on par with garland chrysanthemum (8.85 mg) while the minimum dry weight was noticed in *ageratum* (5.06 mg)

Field studies

Significant differences were observed in respect of field emergence, shoot length, root length, plant height and seedling dry weight among the different flowering annuals studied. Maximum field emergence percentage (82) was recorded by African Marigold, which was on par with garland chrysanthemum (80.67) and China aster (80.33), while the minimum field emergence was recorded by *Ageratum* (57.33). Length of shoot at 25 DAS was found to vary significantly among the flowering annuals under study. The highest shoot length (45 cm) was noticed in *cosmea* on par with African marigold (44 cm), while the minimum shoot length (17 cm) was observed in *gaillardia*. *Zinnia* was found to have the maximum root length of 7.50 cm on par with *cosmea* (7 cm), sunflower (6.75 cm), African marigold (6.50 cm) and *gaillardia* (6 cm). The length of root was minimum (4.25 cm) in *ageratum*.

Cosmea was found to have the highest seedling dry weight (51.50 mg) which was on par with African marigold (51 mg) and *zinnia* (47.50 mg) while the minimum dry weight of seedling (23 mg) was observed in *gaillardia*. Sunflower was

found to have significantly highest plant height at 45 DAT (81.25 cm), which was on par with African marigold (79 cm) and garland chrysanthemum (77.58 cm). The minimum plant height (42.35 cm) was observed in *ageratum*.

Seed germination test on flowering annuals revealed that there were significant differences among them over different days of test. On the second day of test marigold, *cosmea*, sunflower and garland chrysanthemum were on par with each other, whereas on 4th day almost all the species under study were on par except *gaillardia*. They showed maximum number of seeds germinated on 4th day which again decreased to minimum on 6th day. It may be due to the reason that most of the activity of hydrolytic enzymes reached at the peak after 2nd day of test and because of the increased availability of most of the nutritional factors most of the seeds could have germinated by 4th day when compared to 2nd or 6th day. These results were supported by the earlier reports of Vijayalakshmi (1998) on dwarf marigold and Sunitha (2007) on African marigold. Germination Rate Index indicated that the speed of germination was maximum in African marigold which was on par with garland chrysanthemum.

The germination percentage varied significantly among the different flowering annuals which can be attributed to their inherent capacity. Garland chrysanthemum was found to register highest germination capacity. Among the flowering annuals under study, maximum capacity to germinate was recorded by marigold which was on par with china aster, garland chrysanthemum, sunflower, *zinnia* and *ageratum*. The seedling length on 7th day was at maximum in marigold which was on par with garland chrysanthemum, *cosmea*, *zinnia* and china aster. Seedling vigour index was maximum in marigold but was not significantly different from garland chrysanthemum, china aster, *zinnia* and *cosmea*. As regards to seedling dry weight marigold was having the highest value which was on par with garland chrysanthemum and china aster. Vijayalakshmi (1998) on dwarf marigold, Sunitha (2007) on African marigold, Doddagoudar (2004) and Hugar (1997) in *gaillardia* recorded similar observations on respective crops. Thus, laboratory studies revealed that garland chrysanthemum was highly vigorous with respect to germination and seedling vigour. It was next only

Table 1. Number of seeds germinated over different days in flowering annuals
(Number of seeds kept for test were 20)

S.No.	Flowering annual	No. of seeds germinated				Germination Rate Index (GRI)
		2 nd day	4 th day	6 th day	Total	
1.	China aster	6	8	4	18	11.23
2.	Marigold	8	8	2	18	12.60
3.	Gaillardia	5	7	3	15	9.50
4.	Cosmea	7	9	0	16	11.43
5.	Zinnia	6	8	2	16	10.80
6.	Sunflower	7	9	1	17	11.70
7.	Ageratum	6	8	0	14	9.96
8.	Garland chrysanthemum	7	9	1	17	11.97
	S Em	0.25	0.35	0.15	0.55	0.21
	CD at 1%	1.05	1.47	0.63	2.32	0.88

Table 2. Per cent seed germination and seedling vigour in different flowering annuals.

S.No.	Flowering annual	Per cent germination	Shoot length (cm)	Root length (cm)	Seedling length (cm)	Seedling vigour index	Seedling dry weight (mg)
1.	China aster	88.50 (70.15)	3.88	1.57	5.45	482.33	8.18
2.	Marigold	89.00 (70.60)	4.15	2.70	6.85	609.65	10.28
3.	Gaillardia	75.00 (59.98)	3.70	1.60	5.30	397.50	6.10
4.	Cosmea	79.00 (62.70)	3.93	1.64	5.57	440.03	8.36
5.	Zinnia	82.00 (64.87)	3.68	1.80	5.48	449.36	8.22
6.	Sunflower	83.00 (65.62)	3.75	1.15	4.90	406.70	7.35
7.	Ageratum	69.33 (56.35)	2.16	1.21	3.37	233.64	5.06
8.	Garland chrysanthemum	87.00 (68.84)	4.05	1.85	5.90	513.30	8.85
		1.54	0.22	0.21	0.35	42.00	0.38
		6.48	0.93	0.90	1.47	176.82	1.60

Note: Figures in parantheses indicate arcsine transformed values

to African marigold seedling length, seedling vigour index and seedling dry weight on 7th day of study.

Field emergence was recorded maximum by marigold followed by garland chrysanthemum and china aster. However, the seedling length after 25 days of sowing in garland chrysanthemum was found less than the other annuals under study but on par with china aster and gaillardia. On the contrary, the growth rate of garland chrysanthemum picked up after transplanting and thus recording a

higher plant height at 45 days after transplanting which was on par with marigold and sunflower. This may be due to reason that the requirement of minimum heat units for vegetative growth might have been met rather lately in garland chrysanthemum when compared to the other annuals like cosmea, gaillardia and ageratum that showed early accelerated growth. Similar opinion was expressed by Hugar (1997) in gaillardia.

Table 3. Field emergence and seedling vigour at 25 days after sowing in different flowering annuals.

S.No.	Flowering annual	Field emergence at 10 DAS (%)	Shoot length at 25 DAS (cm)	Root length at 25 DAS (cm)	Seedling length at 25 DAS (cm)	Plant height at 45 DAT
1.	China aster	80.33 (63.65)	20.00	5.00	25.00	65.25
2.	Marigold	82.00 (64.87)	44.00	7.00	51.00	79.00
3.	Gaillardia	71.67 (57.82)	17.00	6.00	23.00	44.41
4.	Cosmea	75.33 (60.19)	45.00	6.50	51.50	65.25
5.	Zinnia	73.00 (58.67)	40.00	7.50	47.50	61.55
6.	Sunflower	75.00 (59.98)	38.00	6.75	44.75	81.25
7.	Ageratum	57.33 (49.20)	29.00	4.25	33.25	42.35
8.	Garland chrysanthemum	80.67 (63.89)	21.00	5.25	26.25	77.58
	S Em	0.91	1.25	0.63	1.56	1.65
	CD at 5%	2.76	3.79	1.91	4.73	5.00

Note: Figures in parantheses indicate arcsine transformed values

LITERATURE CITED

- Abdul baki A A and Anderson D 1973** Vigur determination in soybean seed by multiple criteria. *Crop Science*, 13: 630-633.
- Balachandra R A 2001** Influence of nitrogen, phosphorus, spacing and growth retardants on seed yield and quality of ageratum. M.Sc (Agri.) thesis. Univ. of Agric. Sci., Dharwad.
- Doddagoudar S R, Vyakaranahal B S and Shekhargouda M 2004** Effect of mother plant nutrition and chemical spray on seed germination and seedling vigour of china aster cv. Kamini. *Karnataka Journal Agricultural Sciences*, 17(4): 701-704.
- Hartmann H T, D E Kester, F T Davies, J r, and R L Geneve 1997** Plant propagation: Principles and practices. 6th ed. Prentice-Hall, Englewood Cliffs, N.J.
- Hugar A H 1997** Influence of spacing, nitrogen and growth regulators on growth, flower yield and seed yield in gaillardia (*Gaillardia pulchella* var *Picta* Fougar). *Ph.D. thesis*, University of Agricultural Sciences, Dharwad.
- Sunitha H M, Ravihunje, Vyakaranahal B S and Bablad H B 2007** Effect of plant spacing and integrated nutrient management on yield and quality of seed and vegetative growth parameters in African marigold (*Tagetes erecta* Linn.). *Journal of Ornamental Horticulture*, 10(4): 245-249.
- Vijayalakshmi G P 1998** Evaluation of dwarf marigold varieties under NT tract of Karnataka. M.Sc (Agri.) thesis. University of Agricultural Sciences, Dharwad.

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