International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(4): 1571-1573

Received: 15-05-2019
Accepted: 20-06-2019

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Evaluations of marigold (*Tagetus erecta* L.) genotypes for flower yield and xanthophyll content under for North Estern dry zone of Karnataka

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Abstract
A study on evaluation of sixteen African marigold genotypes *viz.*, Arka Bangara, Arka Bangara-2, Arka Agni, Pusa Basanthi Gianda, Pusa Narangi Gianda, Dharwad local, Raichur local, Shahapur local, Ashoka orange, Ashoka yellow, Bhuvan Orange, Maxima yellow, Yellow gold, Indam yellow, Vigro Hybrid Orange, Marigold African Giant for their flower yield and xanthophylls content was carried out in RCBD at College of Agriculture Bheemarayanagudi during 2015-16. Maximum flower yield cv. Arka Bangara-2 (21.77 t/ha), followed by cv. Maxima yellow (19.01 t/ha), cv. Arka Agni (17.13 t/ha) whereas, lowest in the cv. Indam yellow (7.51 t/ha). Highest petal meal yield cv.Arka Bangara-2 (62.30 g/kg and 1.40t/ha of fresh flowers), followed by cv. Arka Agni (51.70g/kg and 0.98t/ha), while minimum cv. Indam yellow (26.21 g/kg and0.27t/ha of fresh flowers) higher xanthophyll content cv. Arka Agni (21.37 g/kg and 20.80kg/ha of fresh flowers) followed by cv. Ashoka orange (15.08 g/kg) minimum in the cv. Arka Bangara (3.52g/kg) and cv. Indam yellow (1.01kg/ha).

Keywords: Marigold, yield, xanthophyll, petal meal and natural colour, *cis*-isomers

1. Introduction
The principal pigment of its flower is xanthophyll, a fat-soluble carotenoid. Carotenoids are widespread pigments in plants and are involved in photosynthesis and photoprotection. The application of carotenoids in medicine and cosmetics is well documented as is their utilization as food additives (colorants and antioxidants). Marigold has been considered as an excellent antioxidant and has been widely used as ingredients for nutritional, cosmetic, and pharmaceutical applications. It is reported that the risk of chronic disease, such as heart disease, cancer and age-related eye diseases might be significantly reduced by diets rich in xanthophyll. Recently, marigold is grown commercially for extraction of carotene pigments mainly xanthophyll. (Grewal and Grewal, 1988) [2].

Presently the global consumption of synthetic dyes is about 10 lakh metric tonnes against the natural dyes of about 15,000 metric tonnes. This demand gap can be met by extracting the natural dyes from plant source. One popular and potential source of xanthophyll is marigold (Sowbhagya and Naidu, 2012) [12].

Karnataka, Telangana and Maharashtra are under contract farming of marigold for xanthophyll extraction. Performance of cultivars varies with region, season and other growing conditions (Tomar *et al*., 1972) [14]. As a result, a promising cultivar and performing well in one region, may fail to perform well in another region of varying climatic conditions. The quest for selecting suitable high yielding variety/hybrid for the region leads to the requirement of collection and evaluation of available genotypes for flower yield and xanthophyll yield.

2. Methodology
The present investigation was carried out to evaluate different marigold (*Tagetus erecta* L.) genotypes for northern Karnataka" for two seasons during *Kharif* (2015-16) and *Summer* (2016-17) in College of Agriculture, B. gudi of Shahapur taluk, Yadgir district. Further, Five plants were selected at random and tagged in each treatment using Randomized Completely Block Design (RCBD) and three replication for the purpose of recording observations on flower yield per plant, flower yield per hectare and xanthophylls yield per kilogram of petal meal were taken during the study period, the first parameter was to assess the flower yield per

plant and per hectare. Secondly, xanthophylls yield per kilogram of petal meal was recorded by one kilogram of fresh flower was taken from each variety at peak flowering stage and kept for shade drying in laboratory for 20 days. Then the dried petals were separated from calyx and seed part of each flower and made into fine powder with the help of grinder mixture. The ground fine powder was weighed variety wise and recorded as petal meal in grams per kilogram of fresh flower and xanthophyll was estimated by AOAC method (Lawrence, 1990) [5].

3. Yield parameters

3.1 Flower yield per plant (g)

The maximum flower yield per plant was recorded in cv. Arka Bangara-2 (940.24 g), followed by cv. Arka Agni (748.32 g), cv. Maxima yellow (642.85 g) whereas, the cv. Shahapur local (240.15 g) recorded minimum flower yield per plan. It is clearly visible that there exists a relationship between number of flowers per plant and flower yield per plant. With the increase in number of flowers per plant, the yield per plant too increases. These results are in conformity with the results reported earlier in marigold by Bhanupratap *et al.* (1999) [1] and Shivakumar (2014) [12] in marigold.

3.2 Flower yield (tonnes) per hectare

There was significant difference among the genotypes with respect to flower yield per hectare. Maximum flower yield per hectare was recorded in the cv. Arka Bangara-2 (21.77 t/ha), followed by cv. Maxima yellow (19.01 t/ha), cv. Arka Agni (17.13 t/ha) whereas, lowest in the cv. Indam yellow (7.51 t/ha). Flower yield per plant is directly related to flower yield per hectare. These findings are similar with the findings reported earlier in marigold by Bhanupratap *et al.* (1999) [1]; Nandkishor and Raghava (2001) [7]; Naik *et al.* (2005) [6] and Narsude *et al.*(2010a).

3.3 Petal meal yield per kg of fresh flower (g/kg) and per hactare (tonnes/ha)

Genotypes showed significant difference with respect to petal meal yield per kilogram of fresh flowers. Highest petal meal yield per kilogram of fresh flowers and per hectare was recorded in cv. Arka Bangara-2 (62.30 g/kg and 1.40t/ha of fresh flowers), which was followed by cv. Arka Agni (51.70g/kg and 0.98t/ha) while minimum was in the cv. Indam yellow (26.21 g/kg and0.27t/ha of fresh flowers) Dry weight of flowers was directly related to the petal meal yield. Greater the dry flower weight, higher the petal meal yield. Similar results were reported in marigold by Naik *et al.* (2005) [6] and Saidulu (2013) [11].

3.4 Xanthophyll content (g/kg and kg/ha of petal meal)

Xanthophyll content varied significantly among the genotypes. The cv. Arka Agni (21.37 g/kg and 20.80kg/ha of fresh flowers) had higher xanthophyll content in the flower petals which was followed by cv. Ashoka orange (15.08 g/kg) and cv. Arka Bangara-2 (10.56kg/ha) was the next in the order. However, minimum xanthophyll content was recorded in the cv. Arka Bangara (3.52g/kg) and cv. Indam yellow (1.01kg/ha) The xanthophyll content varies with genotypes apart from the genotypic factor, colour of flower, petal meal yield and prevailing climatic condition also plays a vital role in higher the petal meal yield, greater the xanthophyll recovery. These findings are in parallel to the findings of Rao *et al.* (2005) [6]; Naik *et al.* (2005) [6]; Iftikhar *et al.* (2011) [3]; Patil *et al.* (2011) [9] and Ingle *et al.* (2012) [4] in marigold.

Table 1: Yield characters in African marigold (*Tagetus erecta* L.) genotypes on number of flowers per plant, flowers yield (Kg) per plant and flower yield (t) per hactare as influenced by genotypes and different planting season (Kharif and Summer)

Genotypes	Yield					
	Flower yield (g) per plant			Flower yield (t) per ha		
	Kharif	Summer	GrandMean	Kharif	Summer	GrandMean
T_1- Arka Bangara	600.21	377.44	488.83	17.47	11.15	14.31
T_2- Arka Agni	926.64	581.00	748.32	20.12	14.14	17.13
T_3- Arka Bangara 2	1021.44	859.04	940.24	25.35	18.18	21.77
T_4- Pusa Basanthi Gianda	571.33	340.29	455.81	12.74	11.38	12.06
T_5- Pusa Narangi Gianda	354.90	463.05	408.98	10.53	13.35	11.94
T_6- Dharwad local	328.82	285.00	306.91	9.09	8.48	8.79
T_7- Raichur local	276.45	235.20	255.83	7.78	7.97	7.88
T_8- Shahapur local	308.70	254.40	240.15	8.95	11.12	10.04
T_9- Ashoka orange	356.46	398.36	377.41	10.48	11.83	11.16
T_{10}- Ashoka yellow	393.12	470.71	431.92	11.55	13.92	12.74
T_{11}- Bhuvan Orange	325.71	407.56	366.64	9.36	11.69	10.53
T_{12} - Maxima yellow	704.70	570.00	642.85	20.86	17.16	19.01
T_{13}- Yellow gold	266.42	427.80	340.14	9.87	12.70	11.29
T_{14}- Indam yellow	252.48	171.60	260.41	7.69	7.33	7.51
T_{15}- Vigro Hybrid Orange	363.44	376.71	370.08	10.68	11.07	10.88
T_{16}- Marigold African Giant	446.43	409.40	427.92	12.01	11.94	11.98
Mean	468.58	414.22	441.40	12.78	12.09	12.44
S.Em±	43.43	36.22	56.58	11.73	34.57	1.68
C.D (P=0.05)	115.50	105.50	171.58	33.88	103.71	5.05

Significant at p = 0.05level of significance.

Table 2: Petal meal yield and xanthophyll content in Marigold (*Tagetus erecta* L.) as influenced by genotypes and planting seasons

Genotypes	Quality attributes											
	Petal meal yield per kg of fresh flower (g)			Petal meal yield per ha (t/ha)			Xanthophyll content (g/kg of petal meal)			Xanthophyll content (kg/ha)		
	Kharif	Summer	Grand Mean	Kharif	Summer	Grand Mean	Kharif	Summer	Grand mean	Kharif	Summer	Grand mean
T_1- Arka Bangara	30.14	28.14	29.14	0.53	0.34	0.43	4.58	2.46	3.52	2.38	0.790	1.59
T_2- Arka Agni	53.27	50.13	51.70	1.07	0.88	0.98	23.63	19.11	21.37	25.00	16.59	20.80
T_3- Arka Bangara 2	64.70	59.89	62.30	1.64	1.16	1.40	8.29	6.77	7.53	13.35	7.77	10.56
T_4- Pusa Basanthi Gianda	33.86	33.86	33.86	0.43	0.39	0.41	7.38	6.16	6.77	3.16	2.41	2.79
T_5- Pusa Narangi Gianda	35.91	33.62	34.77	0.38	0.48	0.43	7.38	5.97	6.68	2.79	2.90	2.85
T_6- Dharwad local	33.33	32.55	32.94	0.31	0.27	0.29	6.42	5.03	5.73	1.94	1.40	1.67
T_7- Raichur local	37.99	37.53	37.76	0.31	0.26	0.29	7.26	5.97	6.62	2.26	1.54	1.90
T_8- Shahapur local	34.32	34.03	34.18	0.30	0.36	0.33	7.13	5.66	6.40	2.18	2.11	2.15
T_9- Ashoka orange	38.62	37.14	37.88	0.41	0.46	0.43	17.24	12.92	15.08	6.93	5.89	6.41
T_{10}- Ashoka yellow	40.00	36.92	38.46	0.47	0.55	0.51	9.23	6.59	7.91	4.30	3.78	4.04
T_{11}- Bhuvan Orange	36.92	35.58	36.25	0.35	0.44	0.40	14.16	8.31	11.24	4.91	3.75	4.33
T_{12} - Maxima yellow	47.29	43.87	45.98	0.99	0.81	0.90	8.37	6.89	7.63	8.16	5.68	6.92
T_{13}- Yellow gold	46.73	43.29	45.01	0.46	0.60	0.53	13.22	10.49	11.86	6.04	6.47	6.26
T_{14}- Indam yellow	26.71	25.71	26.21	0.27	0.26	0.27	4.53	3.14	3.84	1.24	0.78	1.01
T_{15}- Vigro Hybrid Orange	35.69	35.33	35.51	0.29	0.30	0.29	7.60	5.03	6.32	2.15	1.40	1.78
T_{16}- Marigold African Giant	29.19	37.84	38.77	0.35	0.35	0.35	9.76	6.13	7.95	5.79	2.14	3.97
Mean	39.04	37.18	38.44	0.52	0.48	0.50	10.11	7.29	8.53	5.71	4.09	4.94
S.Em±	3.78	3.52	1.49	0.71	0.21	0.49	0.26	0.53	0.71	0.20	0.27	1.17
C.D (P=0.05)	10.92	10.15	4.50	2.02	1.94	1.76	0.76	1.53	2.13	0.59	0.77	3.54

Significant at p = 0.05 level of significance, DAP: Day after planting

5. Conclusion

Result obtained, from the present investigation it can be concluded that genotype Arka Bangara-2, Arka Agni and Maxima yellow were found promising for loose flower and genotypes Arka Agni and Ashoka Orange for xanthophyll content in the North Estern dry zone of Karnataka.

6. Acknowledgments

The authors are thankful to the farmers of Yadgir, Kalaburagi dist and Dr. Hemla Naik, Dr. Ramachandra Naik, Dr. Mahantesh Y. Jogi and Dr. Tayeeb Md. Ulla

7. References

1. Bhanupratap, Tewari GN, Mishra LN, Pratap B. Correlation studies in marigold. J Orn. Hort. 1999; 2(2):84-88.
2. Grewal GS, Grewal SK. Effect of plant antioxidant on the aging of skin tissues. Phytopathol. Mediterr. 1988; 27:112-114.
3. Iftikhar A, Muhammad A, Atyab A, Ahmad S. Fertilization enhances growth, yield, and xanthophyll contents of marigold. Turk J Agric. 2011; 35:641-648.
4. Ingle AJ, Reddy BS, Patil K, Kulkarni BS. Effect of different genotypes, grading and stage of harvest of african marigold (*Tagetes erecta* L.) flowers on recovery of xanthophylls. Res. J Agric. Sci. 2012; 3(1):101-102.
5. Lawrence JF. Determination of total xanthophyll and marigold oleoresin. J Assoc. Off. Anal. Chem. 1990; 2:970-975.
6. Naik HB, Patil AA, Basavarj N, Patil VS. Stability analysis for growth, yield and flower colour (Xanthophyll) in African marigold (*Tagetes erecta* L.). Kar. J Hort. 2005; 1(3):28-36.
7. Nandkishor, Raghava SP. Variability studies in African marigold. J Orn. Hort. 2001; 4(2):105-111.
8. Narsude PB, Kadam AS, Patil VK. Studies on the growth and quality attributes of different African marigold (*Tagetes erecta* L.) genotypes under Marathwada conditions. Asian. J Horti. 2010a; 5(2):407-410.
9. Patil KV, Kulkarni BS, Reddy BS, Kerure P, Ingle A. Yield and quality parameters as influenced by seasons and genotypes in marigold (*Tagetes erecta* L.). Res. J Agric. Sci. 2011; 2(2):344-347.
10. Rao CC, Goud PV, Reddy KM, Padmaja G. Screening of African marigold (*Tagetes erecta* L.) cultivars for flower yield and carotenoid pigments. Indian. J Horti. 2005; 62(3):276-279.
11. Saidulu Y. Effect of pre-harvest foliar sprays, packaging and storage temperatures on growth, yield and storability of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda. *M.Sc. Thesis.* Dr. Y.S.R. Horticultural University, Hyderabad, 2013.
12. Shivakumar. Evaluation of marigold (*Tagetes erecta* L.) genotypes under hill zone. *M. Sc. Thesis*, Univ. Agric *& Hort. Sci*., Shimoga, Karnataka, India, 2014.
13. Sowbhagya HB, Naidu MM. Food Colours. Chemical Industry Digest. 2012; 4(2):25-29.
14. Tomar GS, Laxman S, Sharma D. Effects of environments on character correlation and heritability in green gram. SABRAO News letter. 1972; 4:49-52.