



Research Article

Adoption pattern of improved marigold production technologies by the farmers in Bilaspur district of Chhattisgarh

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SUMMARY : This study was carried out in Bilaspur district of Chhattisgarh during 2010 in two selected blocks. The study aims to assess knowledge and adoption level of marigold growers about recommended marigold production technology. 150 randomly selected farmers who were practicing marigold cultivation were interviewed to collect the primary data. The collected data were analyzed with the help of suitable statistical techniques to draw appropriate conclusions. The findings of this study reveal that the majority (71.33%) of the respondents were having medium overall level of knowledge regarding recommended marigold production technology. 63.33 per cent of the respondents had medium extent of adoption regarding recommended marigold production technology. Variables like- education, social participation, size of land holding, annual income, and contact with extension agencies, source of information and level of knowledge was found to be positively and highly significantly correlated with extent of adoption at 0.01 per cent level of probability.

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KEY WORDS:

Marigold production,
Knowledge, Adoption

BACKGROUND AND OBJECTIVES

In India, marigold ranks first among the loose flowers followed by chrysanthemum, jasmine, tuberose, crossandra and barleria. Today, there is huge demand for natural colours of marigold, calendula, hibiscus, *Gomphrena*, *Petunia* etc. in the international market. Marigold is one such potential flower crops for natural colour extraction.

Marigold (*Tagetes erecta* L.) is not only grown as ornamental cut flower and landscape plant but also as a source of natural carotenoid pigment for poultry feed. It is mainly cultivated for ornamental purpose all over the world. This is a native of Central and South America, especially Mexico, from where it spread to different parts of the world during the early 16th century but marigold has been adapted so well to Indian conditions. In India, marigold was introduced by Portuguese. It became popular and spread quickly because of its easy cultivation, adoptability to varying soils and climatic conditions. It can be grown almost throughout the year. The flowers

are beautiful with blooming period and have excellent vase life. The variable flower size and colours make marigold an ideal flower for decoration as well as garden in marigold is also planted in pots. Besides these marigolds is planted to control the soil nematodes. The earliest report about the resistance of targets to nematodes (*Meloidogyne* spp.) infestation was reported by Tyler (1938) and Steiner (1941) in a field of experiment. Marigold is one of the most important flowers grown commercially in different parts of India. The estimated area under marigold in India was 17,600 ha with a production of 2,00,000 metric tonnes during the year 2003-2004 (Anonymous 2003). It has a very good market in Chhattisgarh, especially in Raipur. There is a large demand of flowers during the festivals like; Dushehra and Diwali as well as marriage seasons. Most of the flower requirements are met by the growers and suppliers of Chennai, Bangalore, Kolkata and Nagpur. Hence, there is a large gap between the supply and demand, the local growers may utilize this advantage and ultimately fulfill the requirement

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of flowers in the state. In general the commercially cultivated marigold is of two types *i.e.*, African marigold (*Tagetes erecta*) and French marigold (*Tagetes patula*). The African marigold is taller and an annual with profuse habit. It produces large sized quality flowers of different colours, which fetches high prices in the market but apical dominance, delay in flowering and long and weak stems are some of the problems. This results in poor yield/ economic returns. As far as favourable conditions are concerned they are beyond the control of human intervention. However, judicious, cultural operations, balanced nutrition and physiological manipulations like pinching improve the yield of the crop. In marigold cultivation, plant spacing is also a factor, which contributes to the total yield (Rathore, 2007). Knowledge is defined as a body of understandable information possessed by an individual or by culture. Rogers (1995) stated that knowledge is of three types namely awareness knowledge, how to knowledge and principle knowledge. In the present study knowledge is studied and study is confined, to the technical information possessed by the respondents about recommended marigold production technology. The structure schedule is developed to caliber the knowledge. Adoption is mental process through which an individual passes from hearing about an innovation to final adoption (Rogers, 1995).

Keeping in view of the above facts in to consideration, the present study was undertaken to find out the following objectives:

- To assess the level of knowledge of marigold growers regarding recommended marigold production technology.
- To determine the extent of adoption of recommended marigold production technology by the marigold growers.
- To determine the relationship between socio-personal, socio-economic, socio-psychological and communicational traits of marigold growers with extent of adoption regarding recommended marigold production technology.

RESOURCES AND METHODS

The present study was carried out in Bilaspur district of Chhattisgarh state. Bilaspur district has 10 blocks, out of which, only 2 blocks were purposively selected namely, masturi and Pendra because these two blocks are having fairly good marigold production. A list of marigold farmers of the selected blocks was obtained from the office of the horticultural department of Bilaspur district and from each selected block, 75 farmers those were practicing marigold cultivation were selected randomly. In this way total 150 marigold growers were selected as respondents. Respondents were interviewed through personal interview. Prior to interview, respondents were taken in to confidence by revealing the actual purpose of the study and full care was taken in to consideration to

develop good rapport with them. For the data collection well designed and pre-tested interview schedule were used. Collected data were analyzed by the help of various statistical tools *i.e.* frequency, percentage, mean and standard deviation, Pearson's co-efficient of correlation, etc.

The knowledge test is composed of questions, of all the package of practices of marigold production technology. A set of questions was developed and discussed with the subject matter specialist and finalized. Total no. of questions for knowing the level of knowledge 16 questionnaires were prepared. To measure the level of knowledge, the list of recommended important practices was prepared and responses for the each practice was obtained into three-point continuum as mentioned below:

Categories	Score
No knowledge	0
Partial knowledge	1
Complete knowledge	2

All the respondents were grouped into three categories as on the basis of mean (\bar{X}) and standard deviation (S.D.).

$$K. I. = \text{Mean } (\bar{X}) \pm \text{S.D. (Standard deviation)}$$

Categories	Formula
Low level of knowledge (up to 13 score)	($< \bar{X} - \text{S.D.}$)
Medium level of knowledge (14 to 21 score)	(In between $\bar{X} \pm \text{S.D.}$)
High level of knowledge (above 21 score)	($> \bar{X} + \text{S.D.}$)

It is operationalized as the degree of use of recommended practices. Adoption refers to the extent of use of recommended farming practices of marigold cultivation by marigold growers. Extent of adoption of respondents about practices in marigold cultivation was measured by taking into consideration that the recommended package of practices for higher production of marigold which was released in the year 2005 by Indira Gandhi Krishi Vishwavidyalaya, Raipur. To measure the extent of adoption, the list of recommended important practices was prepared and responses for the each practice were obtained into three-point continuum as mentioned below:

Extent of adoption	Score
Not adopted	0
Partially adopted	1
Fully adopted	2

The possible adoption score that a respondent could obtain would vary from 0 to 32. On the basis of total adoption score, the adoption index was calculated using the following formula:

$$\text{Adoption index} = \frac{\text{Total adoption score of the respondent}}{\text{Maximum possible adoption score}} \times 100$$

The adoption index was calculated for every respondent. All the respondents were classified into three categories on the basis of using mean (\bar{X}) and Standard deviation (S.D.)

$$\text{A.I.} = \text{Mean } (\bar{X}) \pm \text{S.D. (Standard deviation)}$$

Categories	Formula
Low level of adoption (up to 18 score)	$(< \bar{X} - \text{S.D.})$
Medium level of adoption (19 to 28 score)	$(\text{In between } \bar{X} \pm \text{S.D.})$
High level of adoption (above 28 score)	$(> \bar{X} + \text{S.D.})$

OBSERVATIONS AND ANALYSIS

The results obtained from the present investigation have been discussed in the following sub heads:

Overall level of knowledge of marigold growers:

The data presented in Table 1 indicated that the majority of the respondents (71.33%) had medium level of knowledge regarding recommended marigold production technology, whereas, 18.67 per cent and 10.00 per cent of respondents were having low and high level of knowledge, respectively.

It could be concluded that majority of the respondents (71.33%) had medium level of knowledge of marigold production technology. This finding is supported by Waman *et al.* (1996), Sawant (2002), Kaid *et al.* (2005), Rabari (2006), Nayak and Meti (2007), Roy *et al.* (2007) and Thippeswamy *et al.* (2008).

Practice wise level of knowledge:

The data presented in Table 2 revealed that the 96.00 per cent respondents had high level of knowledge regarding preparation of soil and bed preparation followed by knowledge about use of pre and post harvest technology of marigold flower (86.00%), time of plucking of flower of marigold

Table 1 : Distribution of respondents according to their overall level of knowledge regarding recommended marigold production technology (n =150)

Sr. No.	Level of knowledge	Frequency	Per cent
1.	Low level of knowledge (up to 13 score)	28	18.67
2.	Medium level of knowledge (14 to 21 score)	107	71.33
3.	High level of knowledge (above 21 score)	15	10.00
	Total	150	100
	$\bar{X} = 17.02$		S.D. = 4.21

Table 2 : Distribution of respondents according to practice wise level of knowledge regarding recommended marigold production technology (n =150)

Sr. No.	Selected marigold cultural practices	Level of knowledge		
		Low f(%)	Medium f(%)	High f(%)
1.	Preparation of soil and bed preparation	02 (01.33)	04 (02.67)	144 (96.00)
2.	Varietals selection and seed rate	02 (01.33)	72 (48.00)	76 (50.67)
3.	Seed treatment	57 (38.00)	37 (24.67)	56 (37.33)
4.	Method of propagation	01 (00.67)	143 (95.33)	06 (04.00)
5.	Method of sowing	05 (03.33)	44 (29.33)	101 (67.33)
6.	Time of sowing	23 (15.33)	75 (50.00)	52 (34.67)
7.	Planting and spacing	26 (17.33)	77 (51.33)	47 (31.33)
8.	Use of fertilizer and manure	04 (02.67)	38 (25.33)	108 (72.00)
9.	Irrigation	00 (00.00)	34 (22.67)	116 (77.33)
10.	Control the weeds by mechanical methods	03 (02.00)	25 (16.67)	122 (81.33)
11.	Weed management by herbicides	51 (34.00)	24 (16.00)	75 (50.00)
12.	Control measures of the insect of marigold flower	08 (05.33)	80 (53.33)	62 (41.33)
13.	Control measures of the diseases of marigold flower	83 (55.33)	35 (23.33)	32 (21.33)
14.	Pinching method for marigold flower	103 (68.67)	12 (08.00)	35 (23.33)
15.	Time of plucking of flower of marigold	05 (03.33)	20 (13.33)	125 (83.33)
16.	Use of pre and post harvest technology of marigold flower	02 (01.33)	19 (12.67)	129 (86.00)

Note: figures in parenthesis shows in percentage.

(83.33%), control of the weeds by mechanical methods (81.33%), irrigation (77.33%), use of fertilizer and manure (72.00%), method of sowing (67.33%), varieties selection and seed rate (50.67%), weed management by herbicides (50.00%), control measures of the insect of marigold flower (41.33%), seed treatment (37.33%), time of sowing (34.67%) and planting and spacing (31.33%). Whereas, only 23.33 pinching method for marigold flower, control measures of the diseases of marigold flower (21.33%) and 04.00 per cent of the respondents were having higher level of knowledge about method of propagation.

It is worthwhile to note that 95.33 per cent of the respondents had medium knowledge about method of propagation, followed by recommended control measures of the insect of marigold flower (53.33%), planting and spacing (51.33%), time of sowing (50.00%), varieties selection and seed rate (48.00%), method of sowing (29.33%), use of fertilizer and manure (25.33%), seed treatment (24.67%), control measures of the diseases of marigold flower (23.33%), irrigation (22.67%), control of the weeds by the mechanical methods (16.67%), weed management by herbicides (16.00%), time of plucking of

flower of marigold (13.33%), use of pre and post harvest technology of marigold flower (12.67%), pinching method for marigold flower (08.00%) and 02.67 per cent respondents were having medium knowledge about preparation of soil and bed preparation.

Similarly majority of the respondents were having low knowledge about recommended pinching method for marigold flower (68.67%), control measures of the diseases of marigold flower (55.33%), seed treatment (38.00%), weed management by herbicides (34.00%), planting and spacing (17.33%), time of sowing (15.33%), control measures of the insect of marigold flower (05.33%), method of sowing and also time of plucking of flower of marigold (03.33%), use of fertilizer and manure (02.67%), control of the weeds by mechanical methods (02.00), varieties selection and seed rate, preparation of soil and bed preparation and also use of pre and post harvest technology of marigold flower (01.33%), method of propagation (00.67%), respectively.

The statement that inferred from the Table 2 regarding the practices were preparation of soil and bed preparation, use of pre and post harvest technology of marigold flower,

Table 3: Distribution of respondents according to their overall extent of adoption of recommended marigold production technology (n =150)

Sr. No.	Extent of adoption	Frequency	Per cent
1.	Low extent of adoption (up to 18 score)	32	21.33
2.	Medium extent of adoption (19 to 28 score)	95	63.33
3.	High extent of adoption (above 28 score)	23	15.34
	Total	150	100
	$\bar{X} = 23.18$		S.D. = 5.20

Table 4 : Distribution of respondents according to their practice wise extent of adoption of recommended marigold production technology

(n =150)

Sr. No.	Selected marigold cultural practices	Extent of adoption		
		Low f (%)	Medium f (%)	High f (%)
1.	Preparation of soil and bed preparation	1 (00.67)	11 (07.33)	138 (92.00)
2.	Varietals selection and seed rate	4 (02.67)	84 (56.00)	62 (41.33)
3.	Seed treatment	69 (46.00)	38 (25.33)	43 (28.67)
4.	Method of propagation	5 (03.33)	143 (95.33)	2 (01.33)
5.	Method of sowing	34 (22.67)	70 (46.67)	46 (30.67)
6.	Time of sowing	71 (47.33)	71 (47.33)	8 (05.33)
7.	Planting and spacing	70 (46.67)	69 (46.00)	11 (07.33)
8.	Use of fertilizer and manure	14 (09.33)	58 (38.67)	78 (52.00)
9.	Irrigation	9 (06.00)	46 (30.67)	95 (63.33)
10.	Control of the weeds by mechanical methods	7 (04.67)	49 (32.67)	94 (62.67)
11.	Weed management by herbicides	86 (57.33)	24 (16.00)	40 (26.67)
12.	Control measures of the insect of marigold flower	13 (08.67)	92 (61.33)	45 (30.00)
13.	Control measures of the diseases of marigold flower	64 (42.67)	37 (24.67)	49 (32.67)
14.	Pinching method for marigold flower	125 (83.33)	7 (04.67)	18 (12.00)
15.	Time of plucking of flower of marigold	15 (10.00)	29 (19.33)	96 (64.00)
16.	Use of pre and post harvest technology of marigold flower	4 (02.67)	42 (28.00)	104 (69.33)

Note: figures in parenthesis shows in percentage

time of plucking of flower of marigold, control of the weeds by mechanical methods and irrigation, whereas in case of medium level of knowledge the practices were method of propagation, control measures of the insect of marigold flower, planting and spacing and time of sowing while in case of low level of knowledge the practices were pinching method for marigold flower, seed treatment and weed management by herbicides.

Extent of adoption of recommended marigold production technology:

Overall extent of adoption:

It is clearly indicated from the Table 3 that the majority of the respondents (63.33%) had medium level of adoption about marigold production technology, whereas 21.33 and 15.34 per cent of them had low and high level of adoption, respectively.

It could be concluded that 63.33 per cent of the respondents had medium level of adoption of marigold production technology. Medium to high adoption may be due to the fact that the respondents were educated, possessed large land holdings, belonged to higher income group had better utilization of information sources as progressive farmers, radio, T.V., training and farmers' fair better orientation towards scientific technologies. This finding is supported by Gaikwad (1992), Kadam *et al.* (1998), Meena *et al.* (2003), Meena *et al.* (2005), Padekar *et al.* (2005), Pawar and Sadaguth (2007), Roy *et al.* (2007), Shashidara *et al.* (2007) and Mahadik *et al.* (2008).

Practice wise extent of adoption:

The data presented in Table 4 show that among the selected practices of marigold production technology, the different level of adoption categories 92.00 per cent of the respondents had high level of adoption about preparation of soil and bed preparation followed by use of pre and post harvest technology of marigold flower (69.33%), time of plucking of flower of marigold (64.00%), irrigation (63.33%), control of the weeds by mechanical methods (62.67%), use of fertilizer and manure (52.00%), varieties selection and seed rate (41.33%), control measures of the diseases of marigold flower (32.67%), method of sowing (30.67%), control measures of the insect of marigold flower (30.00%), seed treatment (28.67%), weed management by herbicides (26.67%), pinching method for marigold flower (12.00%), planting and spacing (07.33%), time of sowing (05.33%) and only (01.33%) per cent respondents had high level of adoption towards method of propagation.

While under medium level of adoption category, it was found that most of the respondents (95.33%) adopted method of propagation, followed by control measures of the insect of marigold flower (61.33%), varieties selection and seed rate (56.00%), time of sowing (47.33%), method of sowing (46.67%), planting and spacing (46.00%), use of fertilizer and manure (38.67%), control of the weeds by mechanical methods

(32.67%), irrigation (30.67%), use of pre and post harvest technology of marigold flower (28.00%), seed treatment (25.33%), control measures of the diseases of marigold flower (24.67%), time of plucking of flower of marigold (19.33%), weed management by herbicides (16.00%), preparation of soil and bed preparation (07.33%) and pinching method for marigold flower in marigold were moderately adopted by (04.67%) per cent respondents.

Maximum number of the respondents (83.33%) had low level of adoption regarding pinching method for marigold flower, followed by weed management by herbicides (57.33%), time of sowing (47.33%), planting and spacing (46.67%), seed treatment (46.00%), control measures of the diseases of marigold flower (42.67%), method of sowing (22.67%), time of plucking of flower of marigold (10.00%), use of fertilizer and manure (09.33%), control measures of the insect of marigold flower (08.67%), irrigation (06.00%), control of the weeds by mechanical methods (04.67%), method of propagation (03.33%), varieties selection and seed rate and also use of pre and post harvest technology of marigold flower (02.67%) and preparation of soil and bed preparation (00.67%). The reasons for medium adoption of recommended marigold cultivation practices might be the lack of knowledge about recommended marigold cultivation practices.

Correlation co-efficient analysis:

Correlation co-efficient between the selected characteristics of the respondents with extent of adoption of recommended marigold production technology among marigold growers was also worked out and the values of correlation co-efficient are presented in Table 5. It has been

Table 5 : Correlation analysis of independent variables with extent of adoption regarding recommended marigold production technology

Sr. No.	Independent variables	Correlation co-efficient
		(r) Adoption
1.	Age	-0.151
2.	Education	0.621**
3.	Caste	0.167*
4.	Size of family	0.106
5.	Social participation	0.400**
6.	Occupation	0.165*
7.	Size of land holding	0.260**
8.	Annual income	0.465**
9.	Crédit acquisition	0.169*
10.	Contact with extension agencies	0.636**
11.	Source of Information	0.564**
12.	Level of knowledge	0.886**

* and ** indicate significance of values at P=0.05 and 0.01, respectively
NS=Non-significant

Table 6 : Multiple regression analysis of independent variables with extent of adoption regarding recommended marigold production technology

Sr. No.	Independent variables	Regression co-efficient (b)	't' value
1.	Age	-0.005	-0.220
2.	Education	0.222*	2.545
3.	Caste	0.494*	2.120
4.	Size of family	0.168	0.569
5.	Social participation	0.208**	2.635
6.	Occupation	0.203*	1.989
7.	Size of land holding	0.350*	2.198
8.	Annual income	0.741*	2.263
9.	Crédit acquisition	0.290*	1.982
10.	Contact with extension agencies	0.238*	2.130
11.	Source of Information	0.375*	2.531
12.	Level of knowledge	0.330**	3.292

**Highly significant at 0.01 level of probability R² = 0.806928

*Significant at 0.05 level of probability F value of R=47.69995

NS- Non-significant

seen from the Table 5 that out of all selected characteristics, the seven variables viz., education, social participation, size of land holding, annual income, and contact with extension agencies, source of information and level of knowledge was found to be positively and highly significantly correlated with extent of adoption at 0.01 per cent level of probability.

Whereas, the variables like caste, occupation and credit acquisition were found to be positively and significantly correlated with extent of adoption at 0.05 per cent level of probability regarding marigold production technology.

The other two variables viz., age and size of family has no statistically significant correlation with extent of adoption of recommended marigold production technology.

It has been concluded that the highly positive significant correlation co-efficient was found to be in education ($r = 0.621$), in social participation ($r = 0.400$), size of land holding ($r = 0.260$), annual income ($r = 0.465$), contact with extension agencies ($r = 0.636$), source of information ($r = 0.564$) and level of knowledge ($r = 0.886$), as compared to other variables.

Multiple regression analysis:

The result of multiple regression analysis is presented in Table 6 the result of multiple regression analysis reveals that, out of 12 independent variables, the two variables viz., social participation and level of knowledge contributed positively and highly significantly toward extent of adoption at 0.01 per cent level of probability. Whereas, education, caste, occupation, size of land holding, annual income, crédit acquisition, contact with extension agencies and sources of information contributed positively and significantly toward extent of adoption at 0.05 per cent level of probability. The variables age and size of family had no significant contribution in extent of adoption of recommended marigold production

technology.

For prediction of extent of adoption of recommended marigold production technology with consequences from the significant 't' value of the variables it could be inferred from the regression test that if there is one unit increase in education, caste, social participation, occupation, size of land holding, annual income, crédit acquisition, contact with extension agencies, other sources of information and level of knowledge there would be 0.222, 0.494, 0.208, 0.203, 0.350, 0.741, 0.290, 0.238, 0.375 and 0.330 unit increased, in extent of adoption of recommended marigold production technology. The variables age and size of family had no significant contribution in extent of adoption of recommended marigold production technology. The R² value of 0.806928 indicated that all the 12 independent variables jointly contributed towards extent of adoption of recommended marigold production technology up to extent of 80.69 per cent.

Conclusion:

The study has clearly brought out that the majority of the respondents had medium level of knowledge and 63.33 per cent had medium extent of adoption regarding recommended marigold production technology. On the basis of analysis of practice wise knowledge and adoption, it was found that most of the respondents had high level of knowledge and extent of adoption regarding preparation of soil and bed preparation regarding recommended marigold production technology.

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