

## RESEARCH ARTICLE

# Relative efficiency of production factors on productivity and profitability of castor (*Ricinus communis* L.) under irrigated conditions of Uttar Pradesh

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### SUMMARY

Field experiment conducted at Kanpur (U.P.) during *Kharif* 2007-08 and 2008-09 to assess the performance of production factors in reference to seed yield and economics of castor under irrigated conditions revealed that adoption of full package (fertilizer+weeding + plant protection) resulted in significantly higher seed yield than rest of the treatments. Although deletion of any production factor from whole package caused significant reduction in seed yield but weeding and fertilizer were found more critical than plant protection. Deletion of weeding and fertilizer either alone or in combination with each other indicated drastic reduction in seed yield and non-adoption of plant protection + fertilizer + weeding recorded significantly lowest seed yield during both the years. Non-adoption of these production factors either alone or in conjunction had deleterious effect on economic returns.

**Key Words :** Irrigated conditions, Whole package, Drastic reduction, Economic returns

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Castor (*Ricinus communis* L.) plays most important role in Indian vegetable oil economy. India presently dominating international castor oil market with an export of castor oil worth a foreign exchange of Rs. 845.02 Crores during the year 2005-06 (Damodaram and Hegde, 2007). Being economically an important crop castor cultivation is confined only in few states of Gujarat, Rajasthan, Andhra Pradesh and Tamil Nadu. In order to increase the production of castor in India, its cultivation must be popularized in non-traditional area of country. Agro-climatic conditions of

Uttar Pradesh is quite suitable for castor cultivation (Srivastava, 2007). Different production factors like, fertilizers, weeding and plant protection contribute towards the establishment of the crop stand, growth of the plant and ultimately the total seed yield of castor. But relative contributions of these production factors have not been quantified in castor under irrigated conditions of Uttar Pradesh. Hence, the experiment was conducted to identify the hierarchy of production factors for efficient use of resources for optimum production in non-traditional area of Uttar Pradesh.

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### MATERIAL AND METHODS

The field experiment was carried out at oilseeds

Research Farm, Kalyanpur, C.S.A. University of Agriculture and Technology, Kanpur during *Kharif* 2007-08 and 2008-09 to study the influence of different input factors alone or in combination on productivity and profitability of irrigated castor. The soil of the experimental field was sandy loam in texture with pH 7.8, low in organic carbon (0.43%), low in available phosphorus (11.7 kg/ha) and medium in available potash (150 kg/ha). Treatment consisted of full package and deletion of one or more inputs like fertilizer, weeding and plant protection were laid out in Randomized Block Design with three replications. Recommended dose of fertilizers *i.e.* 50 kg N, 25 kg P<sub>2</sub>O<sub>5</sub> and 15 kg K<sub>2</sub>O in the form of diammonium phosphate (DAP), urea and muriate of potash were applied to the treatments which were not under the deletion of fertilizer. Half of the recommended dose of nitrogen along with entire dose of phosphorus and potassium were applied at the time of sowing in furrows as basal. Remaining half nitrogen was top dressed in two equal splits at 30 and 45 days

after sowing. Castor crop was sown on August 10, 2007 and July 30. Seeds were dibbled 2 seeds/hill at a depth of 4-5cm in rows at 120 cm apart keeping 60 cm plant spacing. The crop was harvested in three pickings manually based on physiological maturity of the capsules. The crop received a rainfall of 518.88 mm and 849.6 mm during crop season in 2007-08 and 2008-09, respectively.

## RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

### Influence of production factors:

#### *Growth and yield attributes :*

Agronomic inputs resulted in significant variation in plant height, length of primary spike and capsules/spike (Table 1). The final plant stand was not influenced significantly by different treatments. The value of growth

**Table 1: Effect of different production factors on the performance of castor**

Treatments	Final plant stand (000/ha)		Plant height (cm)		Primary spike length (cm)		No. of capsules spike		Total seed yield (kg/ha)	
	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09
T <sub>1</sub> Full package	13.8	13.6	79.4	85.9	57.9	69.3	78.8	64.9	1924	2409
T <sub>2</sub> T <sub>1</sub> – Fertilizer (F)	13.5	13.5	71.9	72.5	44.8	63.8	45.5	51.4	1071	1289
T <sub>3</sub> T <sub>1</sub> – Plant protection (PP)	13.8	13.6	75.9	78.9	57.4	65.8	56.7	54.7	1302	1714
T <sub>4</sub> T <sub>1</sub> – Weeding (W)	13.6	13.3	74.3	71.3	46.3	62.6	48.5	50.3	1013	1224
T <sub>5</sub> T <sub>1</sub> –(F + PP)	13.3	13.2	69.1	67.5	44.5	60.6	40.1	48.9	941	1063
T <sub>6</sub> T <sub>1</sub> –(F + W)	13.2	13.3	67.5	61.4	43.6	53.0	39.3	42.3	637	868
T <sub>7</sub> T <sub>1</sub> –(PP + W)	13.6	13.5	69.5	65.9	46.3	57.5	42.9	45.5	911	998
T <sub>8</sub> T <sub>1</sub> –(F + PP + W)	13.0	13.2	59.3	58.6	40.8	47.1	38.7	35.9	593	616
S.E.±	0.3	0.2	1.3	3.5	Li	3.6	1.1	2.6	52	85
C.D. (P=0.05)	NS	NS	4.8	10.5	3.5	9.2	3.3	7.8	158	258

NS= Non-significant

**Table 2: Economics of different castor production factors**

Treatments	Seed yield (kg/ha)		Gross returns (Rs./ha)		Cost of cultivations (Rs./ha)		Net returns (Rs./ha)		B:C ratio	
	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09
T <sub>1</sub> Full package	1924	2409	38480	50589	19703	19995	18777	30594	1.95	2.53
T <sub>2</sub> T <sub>1</sub> – Fertilizer (F)	1071	1289	2142	27069	18317	18518	3103	8551	1.17	1.46
T <sub>3</sub> T <sub>1</sub> – Plant protection (PP)	1302	1714	26040	35994	19306	19597	6734	16397	1.35	1.84
T <sub>4</sub> T <sub>1</sub> – Weeding (W)	1013	1224	20260	25704	17053	16603	3207	9101	1.19	1.55
T <sub>5</sub> T <sub>1</sub> –(F + PP)	941	1063	18820	22323	17919	18121	901	4202	1.05	1.23
T <sub>6</sub> T <sub>1</sub> –(F + W)	637	868	12740	18228	15667	15126	-2927	3102	0.81	1.21
T <sub>7</sub> T <sub>1</sub> –(PP + W)	911	998	18220	20958	16656	16205	1564	4753	1.09	1.29
T <sub>8</sub> T <sub>1</sub> –(F + PP + W)	593	616	11860	12936	15269	14729	-3409	-1793	0.78	0.85

and yield attributes were higher when castor was grown with full package of practices. Plant height and length of primary spike were reduced significantly when weeding and fertilizer were missing either alone or in combination with each other from the recommended package. These two characters were also reduced significantly when fertilizer + plant protection, plant protection  $\pm$  weeding and fertilizer  $\pm$  plant protection +weeding were withdrawn from the full package. Number of capsules/spike was significantly maximum with adoption of full package while deletion of any production factor either along or combination with each other caused significant reduction in number of capsules / spike. Deletion of weeding and fertilizer were observed more critical causing drastic reduction in capsules / spike. Lowest number of capsules / spike was recorded when all these inputs were not practised. Weeding and fertilizer were also reported to be critical in reducing the spike length and number of capsules / spike by Anonymous (2008) and Anonymous (2009).

#### *Total seed yield :*

Adoption of full recommended package of practices recorded significantly highest total seed yield during both the years (Table 1) while significantly lowest seed yield was observed when all these factors like weeding, fertilizer and plant protection measures were not adopted. Although deletion of any production factor either alone or in conjunction from full package caused significant reduction in seed yield but weeding and fertilizer were found more critical and non-adoption of these two important factors either alone or in conjunction resulted in severe reduction in seed yield in both the years. The similar results was also reported by Anonymous (2006).

#### **Economics :**

Economic evaluation of the production factors showed that adoption of full package resulted in maximum gross returns, net returns and B C ratio (Table 2). Although withdrawn of any production factor either alone or in conjunction had deleterious effect on economic returns but non adoption of weeding and fertilizer either alone or in conjunction depressed seed yield substantially and consequently reduced monetary benefits and B:C ratio. Deletion of fertilizer + plant protection + weeding from full package gave negative net returns during both the years. Similar findings were observed by Anonymous (2009).

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