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RESEARCH ARTICLE

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Effect of nipping and dates of sowing on growth, yield and disease infestation of castor genotypes

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ABSTRACT

The experiment was conducted at Agronomy Field Unit, Gandhi Krishi Vignana Kendra [GKVK], University of Agricultural Sciences, Bengaluru during *Kharif* season of 2008-2009 to find out the effect of nipping and dates of sowing on growth, yield and disease infestation of castor genotypes. Periodical staggered nipping to reduce the vegetative growth and unwanted spikes showed very promising results in the genotypes *viz.,* GCH-4 hybrid and Kranthi variety. Hybrid GCH-4 recorded significantly higher seed yield (1835 kg ha^{-1}) as compared to Kranthi variety (1526 kg ha^{-1}) among different dates of sowing. Early sowing of castor (May 30th) recorded significantly higher seed yield (2400 kg ha^{-1}) as compared to June 30th (1771 kg ha^{-1}) and July 30th sowings (870 kg ha^{-1}). Treatments with periodical staggered nipping recorded significantly higher yield (2144 kg ha^{-1}) as against non-nipping (1217 kg ha^{-1}). The crop remains almost free from Botrytis disease infestation in early sown nipped castor (1.58) as against non- nipping under late sown condition (8.27). In nipping, net returns and B: C ratio were noticed significantly higher under periodical staggered nipping (Rs. 24756 ha^{-1} and 2.75, respectively) as compared to non-nipping (Rs. 9862.03 ha^{-1} and 1.80, respectively).

KEY WORDS : Dates of sowing, Nipping, Genotypes, Castor

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INTRODUCTION

Castor (*Ricinus communis* L.) is an important non edible, commercial oil seed crop of our country. It finds a prominent place in dryland due to its drought resistance mechanism through quick growth, deep root system and wax coating on the shoots. In Karnataka, the average production per hectare is far below the country's productivity. Several reasons could be attributed for low productivity of castor in Karnataka. Among them, low yielding varieties, cultivation on marginal lands, poor fertilization, disease, pest attack and uneven time of sowing are the major ones. Further, under cloudy and moist weather conditions, the crop suffers due to infestation of Botrytis and Alternaria gray rot of spikes which often assumes devastating proportion. The plant is capable of producing branches from every auxiliary bud that appears on its main axis. Many times the lower shoots that develop from the auxiliary buds produce spikes which are not as productive as main spike. Nutrition to the lower branches thus gets wasted resulting in production of weaker spikes of short length, with high susceptibility to diseases particularly Botrytis, which contributes for chaffiness, poor seed weight and less yield (Patel *et al*., 1976). Keeping these in view, an attempt has been made in the present study to find out the effect of nipping and dates of sowing on growth, yield and disease infestation of castor genotypes.

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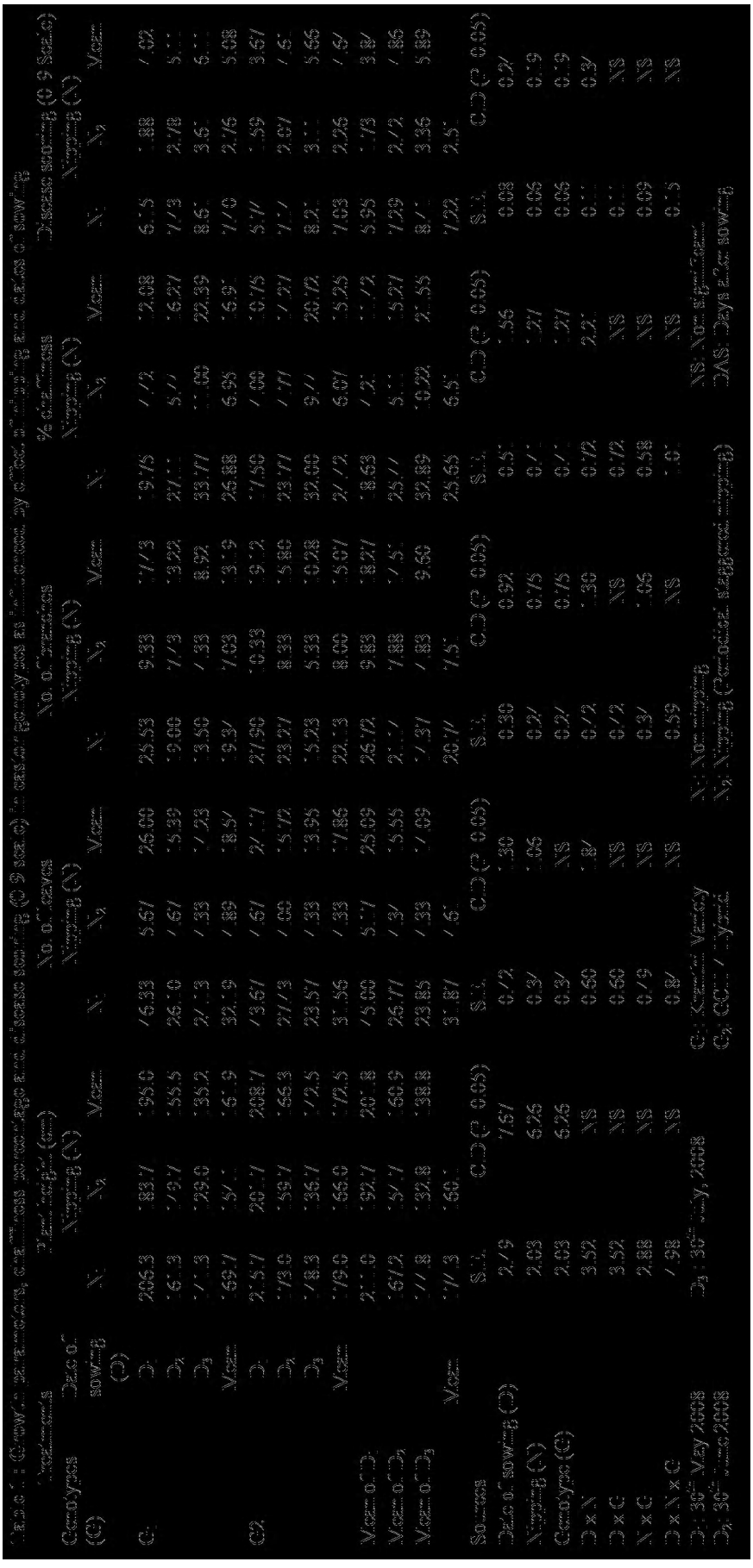
MATERIALS AND METHODS

The experiment was conducted at Agronomy Field Unit, Gandhi Krishi Vignana Kendra [GKVK], University of Agricultural Sciences, Bengaluru during *Kharif* season of 2008-2009 with 2 genotypes *viz.*, GCH-4 hybrid and Kranthi variety under 3 dates of sowing *viz.,* early sown May 30th, June 30th and late sown July 30th with 2 levels of nipping (no nipping and periodical staggerd nipping) in red sandy clay loam. During crop growth period a total rainfall of 821.4 mm was received from June 2008 to

January 2009. The design of the experiment was factorial RCBD with three repplications with a plot size of 27 m^2. The crop was sown at a wider spacing of 120 X 45 cm and fertilized with FYM 5 t ha^{-1} and 38: 38: 25 kg of N: P_2O_5: K_2O. All other agronomical practices were carried out as per the recommended package of practices. The severity of the Botrytis disease was assesed by adopting 1-9 scale (Subramanyam *et al.*, 1982). The methodology of periodical staggered nipping as described below and depicted in Fig. 1. After periodical harvesting the spikes and capsules were dried, threshed and seed yield in each plot was recorded and analyzed statisticaly.

Periodical staggered nipping:

Nipping in case of castor is a selective removal of nodal buds at regular intervals. All the nodal buds in the primary stem except the one just below the primary spike immediately after the emergence of primary spike. The secondary branch emerging just below the primary spike is allowed to grow and it ends with a spike at the tip. Then all the nodal buds of the secondary branch will be nipped-off except the one below the secondary spike. The tertiary branch emerged from the only bud on secondary branch will also end with a spike. All the nodes of tertiary branch will be nipped-off except the one below the tertiary spike. In the same way one quaternary, penta and hexa branches and spikes will be allowed, respectively.



RESULTS AND DISCUSSION

The growth and yield data as influenced by effect of nipping and dates of sowing on growth, yield and disease infestation of castor genotypes is presented in Table 1 and 2. Hybrid GCH-4 recorded significantly higher seed yield (1835 kg ha^{-1}) compared to Kranthi variety 1526 kg ha^{-1} among the different dates of sowing. The higher seed yield of GCH-4 was attributed to higher values of yield components *viz.*, the total number of spikes

per plant (11.01), mean spike length (48.06 cm), number of capsules per spike (53.54) and test weight (28.18 g) compared to Kranthi variety (9.66, 35.04 cm, 41.15 and 25.37 g, respectively) (Table 2). The higher values of above mentioned yield components in GCH-4 hybrid was due to better growth parameters like plant hieght, number of leaves, number of branches. The other parameters responsible for higher yield in GCH-4 were lower Botrytis disease incidence rating (4.64) and low per centage of chaffiness (15.25 %) as compared to Kranthi variety (5.08 and 16.91 %, respectively) (Table 1).

Early sowing in castor (May 30th) recorded significantly higher seed yield (2400 kg ha^{-1}) compared to June 30th (1771 kg ha^{-1}) and July 30th sowings (870 kg ha^{-1}) (Table 2). Similar results of reduced yield parameters due to delayed sowing from different agro-climatic conditions were reported by Baby Akula and Bapi Reddy (1998), Subba Reddy *et al.* (1999) and Hanumanthappa *et al.* (2008) in Southeren India.

The higher seed yield in early sown castor was due to higher number of spikes in May 30th sowing (14.19) as against 10.35 and 6.46 in June 30th and July 30th sowings, respectively. Similarly, the mean spike length was 44.54 cm in May sown crop as against 41.26 cm and 38.86 cm in June and July sown castor, respectively. Other yield parameters *viz*., number of capsules per spike and test weight followed the similar trends (Table2). Sardana *et al.* (2008) and Sukhadia and Dhoble (1992) also reported the similar results of higher yield and its components in early sowing. Variation in yield contributing parameters with different dates of sowing was attributed to variation in growth parameters. The crop sown on May 30th recorded significantly higher growth parameters in castor *viz*., plant height, number of leaves and number of branches per plant as compared to later dates of sowing. The lower Botrytis disease infestation of spikes in early sown castor (3.84 rating) compared late sown castor (4.86 and 5.89 in June and July sown,

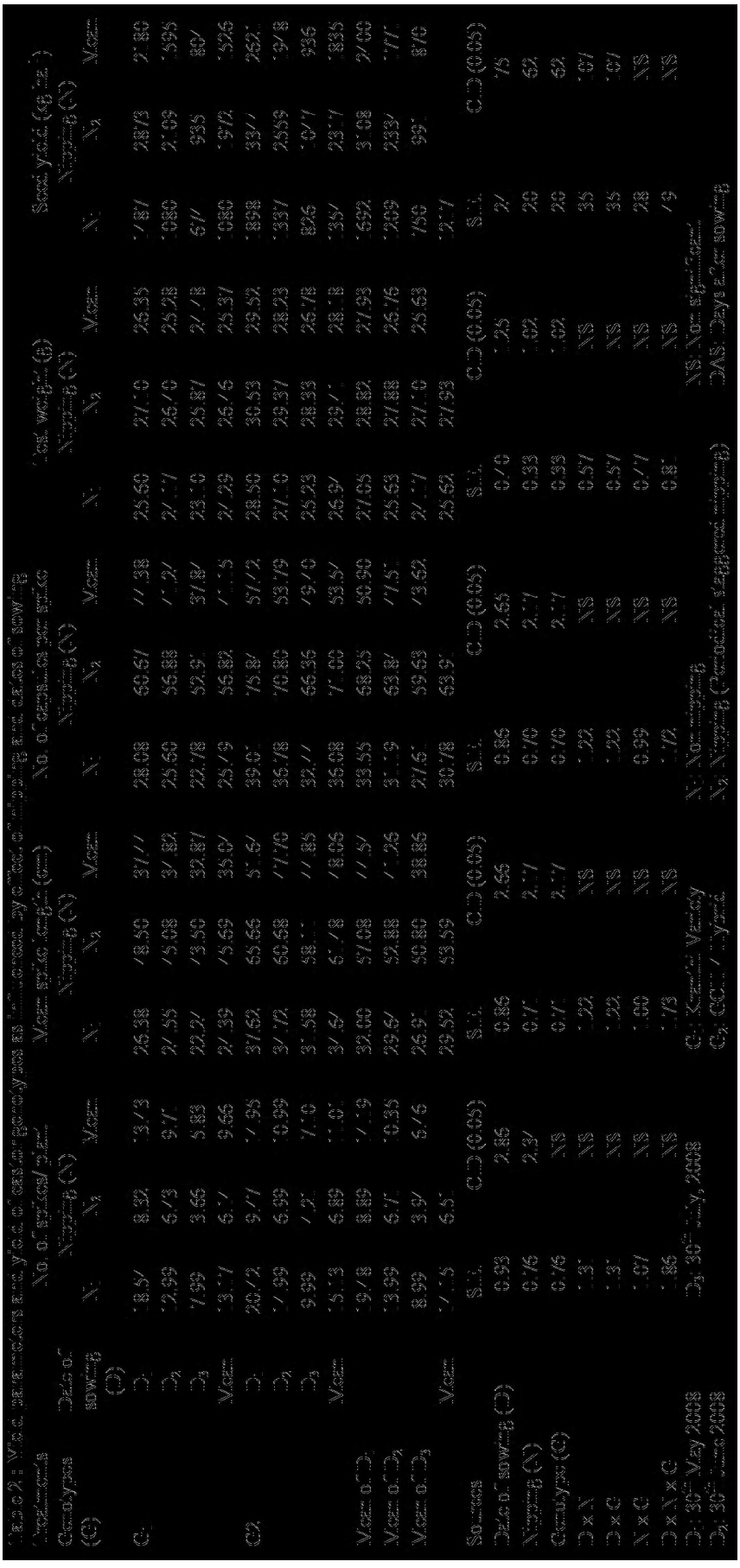


Table 3 : Economics of castor influenced by genotypes, date of sowing and nipping

Treatments		Cost of cultivation (Rs. ha^{-1})			Gross returns (Rs. ha^{-1})			Net returns (Rs. ha^{-1})			B:C ratio		
Genotypes (G)	Date of sowing (D)	Nipping (N)			Nipping (N)			Nipping (N)			Nipping (N)		
		N_1	N_2	Mean	N_1	N_2	Mean	N_1	N_2	Mean	N_1	N_2	Mean
G_1	D_1	12479	14279	13379	26759	51714	39236	14281	37435	25858	2.14	3.62	2.88
	D_2	11879	13679	12779	19444	37963	28704	7566	24284	15925	1.64	2.78	2.21
	D_3	11279	13079	12179	12130	16829	14480	851	3751	2301	1.08	1.29	1.18
	Mean	11879	13679	12779	19444	35502	27473	7566	21823	14695	1.62	2.56	2.09
G_2	D_1	12809	14609	13709	34166	60185	47176	21358	45576	33467	2.67	4.12	3.39
	D_2	12209	14009	13109	24074	46065	35069	11865	32056	21961	1.97	3.29	2.63
	D_3	11608	13409	12508	14860	18843	16851	3251	5434	4343	1.28	1.41	1.34
	Mean	12208	14009	13108	24367	41697	33032	12158	27689	19924	1.97	2.94	2.46
Mean of D_1		12644	14444	13544	30463	55949	43206	17819	41506	29662	2.41	3.87	3.14
Mean of D_2		12044	13844	12944	21759	42014	31886	9716	28170	18943	1.80	3.03	2.42
Mean of D_3		11443	13244	12343	13495	17836	15665	2051	4593	3322	1.18	1.35	1.26
	Mean	12043	13844		21906	38600		9862	24756		1.80	2.75	
Sources		S.E. ±		C.D. (P=0.05)	S.E. ±		C.D. (P=0.05)	S.E. ±		C.D. (P=0.05)	S.E. ±		C.D. (P=0.05)
Date of sowing (D)		NA		NA	1919		5912	1919		5912	0.14		0.43
Nipping (N)		NA		NA	1567		4827	1567		4827	0.11		0.35
Genotype (G)		NA		NA	1567		4827	1567		4827	0.11		0.35
D x N		NA		NA	2713		8361	2713		8361	0.20		0.60
D x G		NA		NA	2713		NS	2713		NS	0.20		NS
N x G		NA		NA	2215		NS	2215		NS	0.16		NS
D x N x G		NA		NA	3837		NS	3837		NS	0.28		NS

D_1: 30th May 2008 D_3 : 30th July, 2008 G_1: Kranthi Variety N_1: Non nipping NS: Non significant
D_2: 30th June 2008 G_2: GCH-4 Hybrid N_2: Nipping (Periodical staggered nipping)
DAS: Days after sowing NS=Non-significant

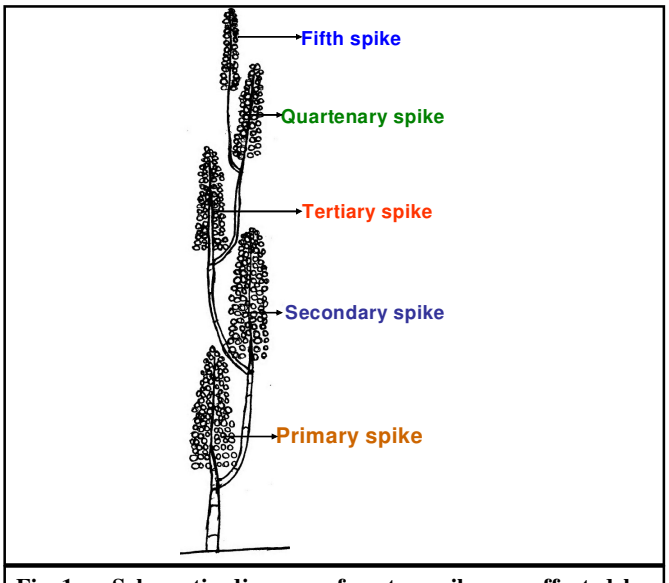


Fig. 1 : Schematic diagram of castor spikes as affected by staggered nipping

respectively) which directly lead to lower chaffiness and higher yield. The results of Botrytis disease severity in late sown castor crop were in agreement with the findings of many workers (Turkhede *et al.,* 1982; Sukhadia and Dhoble, 1992; Baby Akula and Bapi Reddy, 1998; Shivaramu and Krishna Murthy, 2008).

Treatments with periodical staggered nipping recorded significantly higher yield (2144 kg ha^{-1}) as against non-nipping (1217 kg ha^{-1}). This is in confirmity with findings of Shivaramu and Krishna Murthy (2008). The increased yield in periodical staggered nipping plots was attributed to remarkable increase in yield components *viz.*, mean spike length (53.59 cm), number of capsules per spike (63.91), test weight (27.93 g) compared to non-nipping plots (29.52 cm, 30.78 and 25.62 g, respectively). The other parameters like reduced Botrytis disease infestation 2.51 coupled with lower per centage of chaffiness 6.51% in nipping plots as against non-nipping plots (7.22 and 25.65%, respectively) were also more important for the higher yield in periodical staggered nipping plots (Table 2).

Economics:

The GCH-4 hybrid sown in the month of May 30th under periodical staggered nipping recorded higher cost

of cultivation (Rs. 14609 ha^{-1}) as compared to Kranthi variety sown in the month of July 30th under non-nipping (Rs. 11279 ha^{-1}) (Table 3). This was mainly due to more number of labours requirement for the nipping and other operations. The GCH-4 hybrid recorded significantly higher gross returns, net returns and B: C ratio (Rs. 33,032 ha^{-1}, Rs. 19,924 ha^{-1} and 2.46, respectively) as compared to Kranthi variety (Rs. 27,473 ha^{-1}, Rs. 14,695 ha^{-1} and 2.09, respectively). Among dates of sowing, gross returns, net returns and B: C ratio were significantly higher in May 30th sowing (Rs. 43,206 ha^{-1}, Rs. 29,662 ha^{-1} and 3.14, respectively) as against late sown July 30th (Rs. 15665 ha^{-1}, Rs. 3322 ha^{-1} and 1.26, respectively). In nipping, gross returns, net returns and B: C ratio were noticed significantly higher under periodical staggered nipping (Rs. 38,600 ha^{-1}, Rs. 24756 ha^{-1} and 2.75, respectively) as compared to non-nipping (Rs. 21906 ha^{-1}, Rs. 9862.03 ha^{-1} and 1.80, respectively) (Table 3).

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