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Evaluation of *Tikhur* (*Curcuma angustifolia* Roxb) genotypes for growth, rhizome yield, and starch recovery under Bastar plateau region of C.G.

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Abstract
The investigation was undertaken during the year of *Kharif* seasons 2016-17 and 2017-18 at Shaheed Gundadhoor College of Agriculture and Research Station (IGKV) Kumhrawand, Jagdalpur, Bastar (C.G.). The experiment was laid out in Randomized Complete Block Design (RCBD) with ten genotypes of tikhur with four replications. The genotypes were grown randomly in each replication/block in a total of 40 plots of 2.25m × 2 m each containing 40 plants per plot. Observations were recorded from five randomly selected sample plants in each treatment and observed mean value used for statistical analysis. The genotypes showed highest mean performance under growth characters *viz.*, IGDMT-10-1 for plant height, number of leaves per plant, leaf length and leaf breadth. Yield attributing characters genotypes IGBJT-10-1 for number of mother rhizome per plant, IGSJT-10-2 and IGBT-10-4 number of primary rhizome, IGDMT-10-1 for number of secondary rhizome per plant, IGBT-10-4 and IGSJT-10-2 for weight of primary rhizome per plant, IGBT-10-4 for weight of mother rhizome per plant,IGSJT-10-2 for length and thickness of primary rhizome. The IGSJT-10-2 showed highest mean performance for total rhizome yield 34.38 t.ha-1 followed by genotype IGBT-10- 4(31.29 t.ha-1) and IGSJT-10-1(29.71 t.ha-1).

Keywords: Tikhur, *Curcuma angustifolia* Roxb., starch recovery, rhizome yield, evaluation, mean performance

Introduction
Tikhur (*Curcuma angustifolia*; family Zingiberaceae) is a rhizomatous herb also known as white turmeric or East Indian Arrowroot. It's cultivation has now been undertaken by the farmers of Bastar on a large area. Tikhur cultivated as medicinal crop in many parts of the state under moist deciduous mixed and *sal* forest of Madhya Pradesh, Chhattisgarh and Jharkhand. It is generally propagated by rhizomes and good source of starch and fibre (Misra and Dixit, 1983) [10]. Tikhur is also found in central province, Bihar, Maharashtra and Southern part of India. In undivided Madhya Pradesh, it is widely distributed in Bastar, Balaghat, Chhindwara, Surguja, Bilaspur, Raipur and Mandla districts (Kirtikar and Basu, 1918) [6]. In Chhattisgarh, it is found abundantly in the hilly tracts and forests of Bastar, Dantewada, Bijapur, Narayanpur, Kanker, Rajnandgaon, Kawardha, Dhamtari, Bilaspur, Raipur, Korba, Korea and Surguja districts. The total collection of tikhur rhizome as a minor forest produce in Chhattisgarh is 1,90.00 tonnes. Bastar and Bilashpur divisions are the major potentialarea of the state for tikhur (Anonymous, 2005) [1].

In the past, Tikhur was occurring to a large extent throughout the *Sal forest* of Chhattisgarh. But at present the unscientific manner of harvesting and over exploitation have brought its occurrence to the restricted patches In Chhattisgarh especially in Bastar region of the *tikhur* rhizomes produced by the farmers are sold at cheaper rates without its utility in value addition. Thus it is imperative to make best commercial use of this produce by way of utilizing its valuable starch content by transforming into a valuable market product. This will ensure better economic utility of the produce for beneficial of tribal farmers.

Farmers yielded less starch due to lack of improved and high starch yielding genotype. Very little information is available regarding this crop especially collection and evaluation under agro-climatic condition of Chhattisgarh. These kinds of work would ensure *ex-situ* conservation of tikhur plants, besides the economical up scaling of farmers and the augmentation of supply of raw material to pharmaceutical industries. Looking to the importance of the crop for people of the Chhattisgarh an investigation entitled performance of indigeneous genotypes of tikhur (*Curcuma angustifolia* Roxb.) for growth, rhizome and starch

yield was conducted with the objective to study the performance of different indigeneous genotypes of tikhur for growth, rhizome and starch yield.

Material and Methods

The present investigation was conducted at Shaheed Gundadhoor College of Agriculture and Research Station (IGKV), Kumhraw and, Jagdalpur, Bastar, Chhattisgarh during *Kharif* seasons of 2016-17 and 2017-18. Ten indigenous genotypes of tikhur (*Curcuma angustifolia* Roxb.) were collected from AICRP on tuber crop. The experiment taws laid out in Randomized Block Design (RBD) with ten genotypes of tikhur with four replications. The experimental field was prepared by two ploughing up to a depth of 30 cm and FYM thoroughly mixed with soil as Ph of soil was slightly basic in nature. Raised 30 cm planting beds as plot was made to overcome water logging condition and prepared proper drainage channels. Farm yard manure was applied 20 tones/ha and N: 60 kg/ ha, P2O5: 40 kg/ha, K2O: 60 kg/ha during the crop season. Full dose of FYM was mixed in plots during field preparation. Half dose of N and full dose of P and K was mixed in the plots before planting (basal dose) and remaining half dose was applied 45 days after planting during intercultural operation and earthing-up for better rhizome yield. The genotypes were grown randomly in each replication/block in a total of 40 plots of 2.25m × 2m each containing 40 plants per plot and spacing was 45 x20 cm. The crop was grown under rainfed conditions for 6 months. All the observations of the characters were taken from sprouting of rhizomes and up to maturity. The harvested rhizomes were cleaned up and mother rhizomes and finger rhizomes were separated. The flesh colour of rhizomes, dry mater and starch recovery per cent were estimated in horticulture laboratory.

Results and Discussion

The results of performance of indigeneous genotypes of tikhur (*Curcuma angustifolia* Roxb.) for growth, rhizome and starch yield are presented in Table 1 to 3. The mean performance of genotypes for total rhizome yield t/ha, starch recovery (%) and its component characters (Table 1, 2 and 3) for the year 2016-17, 2017-18 and pooled analysis of both the years are described below. Some of the genotypes showed highest mean performance under growth characters *viz.,* IGDMT-10-1 for plant height (cm), number of leaves, leaf length (cm) and leaf breadth (cm) during both the years as compared to local check IGBT-10-1. Some of the genotypes also showed highest mean performance under yield attributing characters of rhizome and starch *viz.,* IGSJT-10-2, and IGBT-10-4 (Fig. 1) for weight of primary rhizome per plant (g). IGBT-10-4 and IGSJT-10-2 was recorded for maximum weight of mother rhizome per plant (g), genotype IGSJT-10-2 for number of primary rhizome per plant, IGBJT-10-1 and IGBT- 10-1 for weight of secondary rhizome per plant (gm), IGSJT- 10-2 for length and thickness of primary rhizome per plant (cm) IGSJT- 10-2 for dry matter per cent of rhizomes per plant, IGSJT-10-2 showed highest mean performance for starch recovery per cent and total rhizome yield t/ha in both the years as compared to local check IGBT-10-1. The variation in starch recovery per cent, growth characters and rhizome yield attributing characters might be due to genetic makeup of plant genotype which expresses their own character.

Table 1: Mean performance of tikhur (*Curcuma angustifolia* Roxb.) genotypes: Pooled analysis

Genotypes	Plant Height	No of leaf	Leaf length	Leaf width	MD	No Mother	NPR	NSR	WMR	WPR	WSR	LMR	LPR	LSR	TMR	TPR	TSR	RYPP	RYTP	RDM
Igblt-10-2	86.06	16.78	35.28	15.02	171.00	1.68	8.66	7.06	57.24	78.94	20.68	5.77	9.06	4.13	9.96	5.03	3.70	32.61	17.42	27.58
Igbt-10-4	92.75	11.18	42.04	14.03	169.88	1.76	8.85	11.33	70.39	183.37	30.53	5.89	9.94	4.21	10.50	5.99	4.17	57.76	31.29	29.69
Igdmt-10-1	109.26	19.50	45.89	19.21	172.63	1.60	11.64	12.79	58.41	146.38	23.93	7.27	10.41	4.96	10.78	5.60	4.86	46.31	26.23	28.72
Igsjt-10-2	94.15	13.14	37.62	13.69	166.88	1.78	11.99	11.98	68.48	205.99	31.38	6.54	11.51	4.78	11.75	6.67	3.30	61.41	34.38	31.59
Igbjt-10-1	72.97	14.62	31.48	12.30	167.75	2.11	8.85	10.27	63.50	157.45	46.47	6.38	9.47	4.27	10.45	5.53	3.77	53.57	29.71	25.09
Igsjt-10-1	96.55	13.95	37.02	13.53	160.00	1.85	9.56	9.81	68.35	118.90	23.85	6.12	8.98	4.50	11.23	6.04	4.03	43.55	23.45	27.30
Igbt-10-1	80.35	12.26	33.85	12.62	170.25	1.83	8.22	6.84	46.33	127.00	40.20	4.85	8.81	4.01	10.27	6.06	3.91	42.29	23.73	27.79
Igrjt-10-1	105.85	18.23	42.56	18.76	171.25	1.60	8.19	9.64	57.43	101.13	19.85	5.32	9.26	4.81	9.96	6.02	4.13	36.70	19.82	27.46
Ignt-10-1	89.29	15.86	42.13	16.48	169.88	1.29	10.02	6.56	60.81	125.67	19.06	5.93	10.03	4.88	8.59	5.75	4.78	42.41	22.84	26.86
Igkt-10-1	74.98	17.70	40.94	15.25	167.38	1.34	8.91	7.76	52.06	134.85	25.92	6.86	9.51	4.18	13.86	4.99	4.36	43.65	22.82	22.49
S Em	1.49	0.33	0.81	0.89	0.40	0.07	0.26	0.45	2.55	3.37	1.09	0.18	0.42	0.15	0.44	0.20	0.16	1.17	0.81	0.64
CV	3.30	4.36	4.17	4.66	0.48	8.37	5.56	9.48	7.40	4.89	3.15	5.86	8.74	6.56	1.29	0.57	0.45	5.09	2.35	4.69
CD	4.32	0.97	2.35	2.57	1.17	0.20	0.77	1.29	8.45	9.78	7.70	0.52	1.23	0.43	8.26	6.86	7.60	3.40	6.43	1.87

Similar results were observed by Dhandar and Varde (1980) [3], Philip and Nair (1983) [14], Pushkaran *et al.* (1985) [16], Pujari *et al.* (1987) [15], Pathania *et al.* (1988) [12], Nandi (1990) [11], Indiresh *et al.* (1990) [5], Maurya (1991) [9], Latha *et al.* (1994) [8], Latha *et al.* (1995) [7], Patil *et al.* (1995) [13], Radhakrishnan *et al.* (1995) [17], Gangadharan *et al.* (1997) [4], Sabu (2006) [18] in Curcuma species, Vimala (2002) [19] in starchy Curcuma species and Anonymous (2008) [2] in Cassava.

Conclusion

The genotypes IGSJT-10-2 IGBT-10-4, IGBJT-10-1 recorded the highest mean performance under yield attributing characters of rhizome and starch, for weight of primary rhizome per plant, weight of mother rhizome per plant, weight of secondary rhizome per plant, thickness of primary rhizome per plant, starch recovery per cent and total rhizome yield t/ha as compared to local check IGBT-10-1.

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