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Effect of enriched Sanjeevani and Agnihotra on growth, yield and quality of brinjal (*Solanum melongena* L.)

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ABSTRACT

Brinjal is a crop grown widely all over India and preferred by both rich and poor. The Chhotanagpur plateau of Jharkhand is famous for quality vegetable production and brinjal is very commonly grown in this region almost throughout the year. However, the most of the commercial growers using plant protection chemicals and synthetic fertilizers those are so expensive that poor farmers can't afford. The extensive uses of agro-chemicals and synthetic fertilizers also reduce the quality of both the produce and the cultivated soil. In this context, an attempt has been made through the present investigation by growing different varieties of brinjal by adopting Vedic (*Enriched Sanjeevani*) Farming and Homa Induction (*Agnihotra*) techniques with their respective four non-chemical alternative growing approaches, viz. E₁C₁: *Enriched Sanjeevani* (1%), E₁C₂: Absolute Control (inherent fertility status of the experimental plot); E₂C₁: *Enriched Sanjeevani* (1%) + Homa Induction (*Agnihotra*), and E₂C₂: Only Homa Induction (*Agnihotra*). Five varieties of the crop, viz. V₁: Swarna Pratibha; V₂: Swarna Neelima; V₃: Swarna Shakti; V₄: Mukta Jhuri; V₅: Long Green were grown with their four replications under four growing conditions and the Randomized Completed Block Design was adopted for field trials. Different growth, yield and quality attributing characters of the crop were taken into account and findings revealed that E₂C₁: *Enriched Sanjeevani* (1%) + Homa Induction (*Agnihotra*) was the most suitable growing condition for V₂ (Swarna Neelima) with the maximum yield (72.37 t ha⁻¹). Different growth and yield attributes of the crop varieties (especially in the case of V₂: Swarna Neelima) were highly influenced by *Enriched Sanjeevani* (1%) + Homa Induction (*Agnihotra*) [E₂C₁] growing condition resulting higher benefit cost ratio of 6.78. Quality contributing attributes were also highly influenced by homa induction (*Agnihotra*), as a consequence, higher level of dry matter, TSS, and ascorbic acid contents were estimated from almost all samples collected from E₂C₁: *Enriched Sanjeevani* (1%) + Homa Induction (*Agnihotra*), and E₂C₂: Only Homa Induction (*Agnihotra*) growing conditions.

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INTRODUCTION

Brinjal or eggplant (*Solanum melongena* L.) is a member of the family Solanaceae and it is an herbaceous annual with an erect or semi-spreader branching in nature. The fruit of brinjal is a berry grows individually or in clusters. It is grown commonly in almost all parts of the country and liked by both poor and the rich community. India is considered as the primary centre of origin and diversity of brinjal (Patil *et al.*, 2008). Brinjal is a nutritious vegetable with short growth duration but it requires more chemical fertilizer especially nitrogenous ones and pesticides. Huge amount of agro-chemicals causes severe health hazard and affect fertility status of soils. A report reads about 355,000 people die globally every year for the poisoning of different agrochemicals especially pesticides and two third of the global death due to chemical farming is from the developing countries

like India (Sharon and Nishanthlalu, 2014). This problem can only be overcome by the traditional organic farming, the concept of which was started 10000 years ago in the Vedic age. At that time the chemicals were not there but they can protect their plant, they can grow their food and can feed their people. After independence as well as partition the amount of land divided but the populations of India do not decrease at the same ratio of the land. As a result food scarcities arise. After World War-II, the countries who stop their business of weapons they started the business of chemical fertilizer, and they choose the Trans Gangetic plain as their place of extension and so called green revolution started through HYVP (High Yielding Variety Programme). The high yielding variety needs more fertilizer, more water as a result today Trans Gangetic plain become an unfertile land. The organically produced liquid manures can rejuvenate those areas. An organic liquid formulations namely *Sanjeevani* (here, *Enriched Sanjeevani*) is a substance which

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make the soil immortal. *Enriched Sanjeevani* is one of the basic liquid manures consist of cow dung, cow urine, water, molasses and farm soil. Mix those in proper ratios (generally, 1:1:10 proportions of cow dung: Cow urine: water and one handful of garden soil and 50 g of molasses are sufficient for each kilogram of cow dung). The mixture is required to dilute 10 times before application in soil after three days of fermentation and 200 liter of *Enriched Sanjeevani* is sufficient for one acre of land. From only making of two liters mother solution we can easily meet the need for one acre, because the recommended dose of *Enriched Sanjeevani* is 1%. Homa farming is the advanced organic farming, an alternative farming technique, in which an additional basic homa (*Agnihotra*) is done daily twice at the time of sunrise and sunset with any recommended organic package. According to the ancient science of homa, plants take 30% nutrients from the soil and 70% from its atmosphere. Homa farming is not only to provide nutrients through the atmosphere, it is the healing process of the atmosphere which is disturbed and become unhealthy to the human and plants due to the pollution. The ash of the *Agnihotra* is very good for soil and can be used to maintain the pH in any liquid or solid manure. The ash increases the water soluble phosphorus in the soil and basically it helps in mobilizing the nutrient. After a detailed study it is find that under the homa condition the chlorophyll of the plants are increased, and those are the main cause of the faster growth and yield maximization. But till now it is not clear that how the mechanism of burning organic substance in semi pyramid copper pot is effecting the chlorophyll growth (Berk and Jhonson, 2009). Pathak (2009) suggested to realize the possibility of integration of few techniques of organic farming for their synergistic impact and coined new term *Homa Jaivik Krishi*. This has compelled to conceive an organic production system, which is capable of enhancing rhizosphere and biosphere simultaneously which are popularizing today as “Homa Jaivik Krishi” (Pathak and Ram, 2010). Different alternative approaches of farming practices, especially organic farming has greater role over growth, yield and quality of brinjal. In this context, different researchers realized significant effect of organic manures in the forms of vermicompost, poultry manure, cow dung etc. over yield and quality traits of brinjal or other crops as well as soil physicochemical properties (Singh, 2004; Ullah *et al.*, 2008; Mahto and Dutta, 2018).

MATERIALS AND METHODOLOGY

The present experiment was carried out at the organic experimental plot of Integrated Rural & Tribal Development and Management Faculty Centre under the School of Agriculture and Rural Development of Ramakrishna Mission Vivekananda Educational and Research Institute, Morabadi, Ranchi (Latitude: 23°23'59"N, Longitude: 85.20°15"E) during *rabi*-summer season of 2017-2018 under temperature regimes of 26°-42°C (Max.) and 14°-27°C (Min.) with the mean of 19°-33°C. Five varieties of brinjal were exposed to grow through two non-chemical growing approaches, *viz.* *Vedic* and *Agnihotra Farming*. For *Vedic Farming* enriched *Sanjeevani* was taken as plant nutrient source. *Sanjeevani* with its enriched formulation was prepared by using cow dung, cow urine and water with their 1:1:10 proportion mixture and one handful of garden soils and

50 g of molasses were added for each one kg of cow dung. The mixture was allowed to ferment for three days and thereafter the mixture was diluted 10 times with plain water before applying in the crop. As the *Agnihotra* may affect the crop up to one acre radius, thereby two separate experiments were conducted simultaneously in two different plots but enriched *Sanjeevani* was applied as supplementary source of plant nutrients in one sub-condition of *Agnihotra* farming. Thereby, two experiments were conducted under four different (two each) sub-conditions, namely E_1C_1 : Enriched *Sanjeevani* (1%), and E_1C_2 : Absolute Control (Inherent Fertility Status of Experimental Soil) for *Vedic Farming*; and E_2C_1 : Enriched *Sanjeevani* (1%) + Homa Induction (*Agnihotra*), and E_2C_2 : Only Homa Induction (*Agnihotra*) for *Agnihotra Farming*. Finally, field experiments were carried out through Randomized Complete Block Design by employing five varieties of brinjal, such as V_1 : Swarna Pratibha; V_2 : Swarna Neelima; V_3 : Swarna Shakti; V_4 : Mukta Jhuri; V_5 : Long Green with their four replication for each of the sub-condition of the *Agnihotra* and *Vedic Farming*. 30 days old seedlings were transplanted in 80 experimental plots each of with 3.0 m x 2.0 m sizes by keeping 60 cm inter-row and 50 cm intra-row spacing. As basal application vermicompost was applied @ 5 t ha⁻¹ (in all plots except 20 plots of E_1C_2 : Absolute Control) and liquid organic formulation (enriched *Sanjeevani*) was applied 5 times at 15 days interval starting from 30 days after transplanting @ 500 ml plant⁻¹. *Agnihotra mantras* [at sunrise: *Sooryáya swáhá sooryáya idam na mama* (add the first portion of rice after Swáhá), *Prajápataye swáhá prajāpataye idam na mama* (add the second portion of rice after Swáhá); at sunset: *Agnaye swáhá agnaye idam na mama* (Add the first portion of rice after Swáhá), *Prajápataye swáhá Prajápataye idam na mama* (add the second portion of rice after Swáhá)] were performed twice daily during morning (at sunrise) and evening (at sunset) hours as per the location specific *Agnihotra* calendar. As plant protection measures, *Dashpurni* and neem leaf extract were applied 15 days interval against insect-pests as prophylactic measure, whereas, turmeric powder mixed whey water @ 10% solution was sprayed at 15 days interval as against the pathogenic infection. Different growth, yield and quality attributes of the crop namely plant height (cm), days to 50% flowering, number of fruits plant⁻¹, average fruit weight (g), yield (t ha⁻¹), dry weight of fruit pulp (%), TSS(°Brix), total sugar (%), reducing sugar (%) and ascorbic acid (mg 100 g⁻¹) were taken into account and estimated as per the standard procedures (wherever applicable). Data thus obtained were subject to statistical analyses for their interpretation. Economics of organically grown brinjal was also studied by considering total cost of cultivation (Rs.), yield (t ha⁻¹), farm gate price (Rs.), total income (Rs.), net profit (Rs.) and B: C ratio.

RESULTS AND DISCUSSION

Findings related to different growth and yield attributes of brinjal as influenced by different alternative approaches of farming practices *viz.* E_1C_1 : Enriched *Sanjeevani* (1%), E_1C_2 : Absolute Control (Inherent Fertility Status of Experimental Soil); E_2C_1 : Enriched *Sanjeevani* (1%) + Homa Induction (*Agnihotra*), and E_2C_2 : Only Homa Induction (*Agnihotra*) presented through Table-1. Data clearly indicated that plant

Table 1: *Per se* performance of different growth and yield attributes of different *brinjal* varieties as influenced by alternative approaches of growing conditions

Variety	Plant height (cm)				Days to 50% flowering				Number of fruits plant ⁻¹				Average fruit weight (g)				Yield (t ha ⁻¹)			
	E ₁ C ₁	E ₁ C ₂	E ₂ C ₁	E ₂ C ₂	E ₁ C ₁	E ₁ C ₂	E ₂ C ₁	E ₂ C ₂	E ₁ C ₁	E ₁ C ₂	E ₂ C ₁	E ₂ C ₂	E ₁ C ₁	E ₁ C ₂	E ₂ C ₁	E ₂ C ₂	E ₁ C ₁	E ₁ C ₂	E ₂ C ₁	E ₂ C ₂
V ₁	45.88	40.75	46.56	42.39	56	64.75	50	55.75	5.75	2.77	7.19	4.19	93.16	84.38	169.01	129.08	17.84	7.78	40.47	18.01
V ₂	60.19	39.56	60.19	53.74	60.25	74.25	56.75	61.75	4.00	2.04	7.94	2.75	192.28	122.88	273.73	330.81	25.61	8.35	72.37	30.29
V ₃	50.13	38.81	52.75	43.44	64	73.25	56.25	72.5	5.63	4.00	7.81	6.06	101.71	99.79	159.93	106.22	19.07	13.29	41.59	21.43
V ₄	39.38	43.06	35.38	39.13	73.75	74.25	70.25	61.5	6.13	4.19	8.00	5.81	54.88	61.59	116.69	86.86	11.20	8.59	31.09	16.81
V ₅	36.25	33.60	34.88	28.75	73.5	85.25	72.5	69	9.13	5.19	7.44	8.50	79.01	70.35	147.22	95.65	24.02	12.16	36.47	27.07
SEm	3.42	2.25	2.30	2.69	2.31	2.07	1.81	3.83	1.49	0.37	0.99	0.33	5.86	1.63	7.80	3.92	1.62	1.01	3.84	1.28
(±)																				
CD _{P=0.05}	8.62	5.66	5.80	6.78	5.83	5.21	4.56	NS	NS	0.93	NS	0.83	14.76	4.09	19.58	9.84	4.07	2.53	9.19	3.24

NS: Non-significant; V₁: Swarna Pratibha; V₂: Swarna Neelima; V₃: Swarna Shakti; V₄: Mukta Jhuri; V₅: Long Green; E₁C₁: *Enriched Sanjeevani* (1%), E₁C₂: Absolute Control (Inherent Fertility Status of Experimental Soil); E₂C₁: *Enriched Sanjeevani* (1%) + Homa Induction (*Agnihotra*), and E₂C₂: Only Homa Induction (*Agnihotra*)

Table 2: *Per se* performance of different quality contributing attributes of *brinjal* varieties under alternative approaches of non-chemical growing condition

Variety	Dry weight of fruit pulp (%)				TSS (°Brix)				Total Sugar (%)				Reducing Sugar (%)				Ascorbic Acid (mg 100 g ⁻¹)			
	E ₁ C ₁	E ₁ C ₂	E ₂ C ₁	E ₂ C ₂	E ₁ C ₁	E ₁ C ₂	E ₂ C ₁	E ₂ C ₂	E ₁ C ₁	E ₁ C ₂	E ₂ C ₁	E ₂ C ₂	E ₁ C ₁	E ₁ C ₂	E ₂ C ₁	E ₂ C ₂	E ₁ C ₁	E ₁ C ₂	E ₂ C ₁	E ₂ C ₂
V ₁	8.19	6.87	11.19	9.95	2.03	1.95	5.20	3.23	3.68	1.95	4.84	2.66	2.46	2.41	3.33	3.15	6.00	1.50	8.50	3.75
V ₂	8.24	6.43	13.04	9.73	3.03	2.03	4.30	3.00	3.20	2.35	3.97	3.56	2.61	2.21	3.04	3.08	4.00	2.50	9.00	5.50
V ₃	7.25	8.13	10.20	9.74	1.95	1.93	5.98	3.13	3.27	1.90	3.74	3.04	3.76	3.23	3.42	3.09	4.50	2.25	11.38	4.38
V ₄	9.87	7.61	13.10	11.76	1.98	1.98	3.25	2.75	3.09	2.59	4.96	3.26	2.44	2.12	2.75	2.94	3.00	3.50	8.25	6.13
V ₅	9.27	7.17	11.71	10.99	1.88	1.08	2.23	2.20	2.35	1.79	3.52	3.08	2.67	2.42	3.52	2.97	5.50	6.00	9.63	9.25
SEm (±)	0.35	0.15	1.06	0.76	0.06	0.10	0.11	0.16	0.03	0.02	0.10	0.05	0.04	0.04	0.09	0.08	0.25	0.35	1.06	0.41
CD _{P=0.05}	0.89	0.37	NS	NS	0.14	0.25	0.29	0.41	0.07	0.04	0.26	0.13	0.09	0.10	0.22	NS	0.62	0.88	NS	1.03

NS: Non-significant; V₁: Swarna Pratibha; V₂: Swarna Neelima; V₃: Swarna Shakti; V₄: Mukta Jhuri; V₅: Long Green; E₁C₁: *Enriched Sanjeevani* (1%), E₁C₂: Absolute Control (Inherent Fertility Status of Experimental Soil); E₂C₁: *Enriched Sanjeevani* (1%) + Homa Induction (*Agnihotra*), and E₂C₂: Only Homa Induction (*Agnihotra*)

Table 3: Cost of cultivation of *brinjal* in one hectare of land under different alternative approaches of non-chemical growing conditions

Components	E ₁ C ₁	E ₁ C ₂	E ₂ C ₁	E ₂ C ₂
Cost (A ₁)				
Cost of hired labour for land preparation (Rs.)	2000.00	2000.00	2000.00	2000.00
Hired labour cost for sowing and transplanting (Rs.)	5000.00	5000.00	5000.00	5000.00
Cost of hired machinery (Rs.)	1500.00	1500.00	1500.00	1500.00
Cost of own machinery (Rs.)	0.00	0.00	0.00	0.00
Cost of planting material (Rs.)	4000.00	4000.00	4000.00	4000.00
Cost of plant protection (Rs.)	3000.00	3000.00	3000.00	3000.00
Cost of mulching (Rs.)	2500.00	2500.00	2500.00	2500.00
Cost of manure (vermicompost) (Rs.)	15000.00	0.00	15000.00	15000.00
Cost of enriched <i>Sanjeevani</i> (Rs.)	3500.00	0.00	3500.00	0.00
Cost of performing <i>Agnihotra</i> (Rs.)	0.00	0.00	2500.00	2500.00
Hired labour cost for weeding and hoeing (Rs.)	7500.00	7500.00	7500.00	7500.00
Cost of irrigation (Rs.)	5000.00	3000.00	5000.00	5000.00
Hired labour cost for harvesting and post-harvest operations (Rs.)	3000.00	2000.00	3000.00	3000.00
Miscellaneous cost (Rs.)	4000.00	4000.00	4000.00	4000.00
Total (A1) [Rs.]	56000.00	34500.00	58500.00	55000.00
Cost (A2)=Cost A1+rent on leased in land (Rs.)				
Rent on leased in land (Rs.) [own land]	0.00	0.00	0.00	0.00
Total (Rs.)	56000.00	34500.00	58500.00	55000.00
Cost (B1)=Cost A2+interest on own fixed capital (Rs.)				
Interest on own fixed capital (Rs.)	500.00	500.00	500.00	500.00
Total (Rs.)	56500.00	35000.00	59000.00	55500.00
Cost (B2)=Cost B1+rental value of own land (Rs.)				
Rental value of own land (Rs.)	2500.00	2500.00	2500.00	2500.00
Total (Rs.)	59000.00	37500.00	61500.00	58000.00
Cost (C)=Cost B2+cost of own family labour (Rs.)				
Cost of own family labour (Rs.)	2500.00	2500.00	2500.00	2500.00
Total (Rs.)	61500.00	40000.00	64000.00	60500.00

Table 4: Benefit cost ratio of growing different varieties of brinjal in one hectare of land through different alternative approaches of non-chemical growing conditions

Components	E ₁ C ₁ : <i>Enriched Sanjeevani</i> (1%)					E ₁ C ₂ : Absolute Control (Inherent Fertility Status of Experimental Soil)					E ₂ C ₁ : <i>Enriched Sanjeevani</i> (1%) + Homa Induction (<i>Agnihotra</i>)					E ₂ C ₂ : Only Homa Induction (<i>Agnihotra</i>)				
	V ₁	V ₂	V ₃	V ₄	V ₅	V ₁	V ₂	V ₃	V ₄	V ₅	V ₁	V ₂	V ₃	V ₄	V ₅	V ₁	V ₂	V ₃	V ₄	V ₅
Total Cost of Cultivation (Rs.)	61500.00					40000.00					64000.00					60500.00				
Yield (t ha ⁻¹)	17.84	25.61	19.07	11.20	24.02	7.78	8.35	13.29	8.59	12.16	40.47	72.37	41.59	31.09	36.47	18.01	30.29	21.43	16.81	27.07
Farm Gate Price ^a (Rs. kg ⁻¹)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Total Income Rs.ha ⁻¹)	107040.00	153660.00	114420.00	67200.00	144120.00	46699.77	50084.90	79752.17	51560.81	72950.28	242820.00	434220.00	249540.00	186540.00	218820.00	108060.00	181740.00	128580.00	100860.00	162420.00
Net Profit (Rs.ha ⁻¹)	45540.00	92160.00	52920.00	5700.00	82620.00	6699.77	10084.90	39752.17	11560.81	32950.28	178820.00	370220.00	185540.00	122540.00	154820.00	47560.00	121240.00	68080.00	40360.00	101920.00
B:C Ratio	1.74	2.50	1.86	1.09	2.34	1.17	1.25	1.99	1.29	1.82	3.79	6.78	3.90	2.91	3.42	1.79	3.00	2.13	1.67	2.68

* - Considering the average prevalent price at farm gate level during harvesting the crop but premium price of organic produce was not considered here due to absenteeism of organic certification; V₁: Swarna Pratibha; V₂: Swarna Neelima; V₃: Swarna Shakti; V₄: Mukta Jhuri; and V₅: Long Green

height (cm), number of fruits plant⁻¹, and average fruit weight (g) recorded more in the case of V₂ (Swarna Neelima) under all growing conditions (Table 1) resulting higher yield in all cases. However, more yield (72.37 t ha⁻¹) recorded under E₂C₁ [*Enriched Sanjeevani* (1%) + Homa Induction (*Agnihotra*)] followed by only 30.29 t ha⁻¹ in E₂C₂[Only Homa Induction (*Agnihotra*)] growing condition (Table 1). This type of findings may probably be due to the synergistic impact of the integration of organic farming and Homa farming as *Homa Jaivik Krishi* (Pathak, 2009) and the higher level of yield as recorded here close conformity with the earlier observation of Kumar *et al.* (2017) where they observed better growth and yield in okra grown through Homa Organic treatments. Besides, in homa farming condition the chlorophyll of the plants are increased, and those are the main cause of the faster growth and yield maximization (Berk and Jhonson, 2009).

Quality contributing traits were also significantly influenced by *Vedic* and *Agnihotra* farming with more dry matter content (13.10%) in E₂C₁: *Enriched Sanjeevani* (1%) + Homa Induction (*Agnihotra*), followed by 11.76% as recorded in E₂C₂: Only Homa Induction (*Agnihotra*) in the case of V₄ (Mukta Jhuri) (Table 2). Other qualitative attributes were also greatly influenced by the *Vedic* and *Agnihotra* Farming over the absolute control and findings revealed significant effect of *Agnihotra* farming over TSS (°Brix), reducing sugar (%), total sugar (%) and ascorbic acid (mg 100 g⁻¹) than respective other counterparts (Table 2). Such findings especially in the case of homa induction (*Agnihotra* Farming) clearly supported the capability of homa farming on enhancing rhizosphere and biosphere simultaneously (Pathak and Ram, 2010) and higher level of ascorbic acid in homa induced growing conditions as recorded in the present investigation corroborated well with the previous findings of Kumar *et al.* (2017).

Economics of brinjal cultivation through non-chemical approaches of different growing condition highlighted that total cost of cultivation in one hectare of land as recorded here as Rs.61500.00 (E₁C₁), Rs. 40000.00 (E₁C₂), Rs. 64000.00 (E₂C₁) and Rs. 60500.00 (E₂C₂) (Table 3). In case of E₁C₁ the highest B:C ratio was recorded in V₂ (2.50) whereas in case of E₁C₂, the highest B:C ratio documented in V₃ (1.99), in case of E₂C₁ the best B:C ratio recorded in V₂ (6.78) while the alternative approach of E₂C₂ growing condition showed that the highest B:C ratio in V₂ (3.00) and almost all varieties showed their best in the alternative approach of growing condition E₂C₁ [*Enriched Sanjeevani* (1%) + Homa Induction (*Agnihotra*)] (Table 4). The findings also revealed that almost all alternative approaches of non-chemical growing approaches performed significantly well over the respective absolute control counterpart (Table 4).

CONCLUSION

From the above findings, it can be concluded that the alternative growing condition E₂C₁ [*Enriched Sanjeevani* (1%) + Homa Induction (*Agnihotra*)] showed the better result in terms of the yield as well as the quality traits expression. In this context, the yield of V₂ (Swarna Neelima) in the alternative growing

condition of E_2C_1 recorded the maximum yield (72.37 t ha^{-1}) over rest of the varieties under consideration. As a consequence, the highest B:C ratio 6.78 was recorded in V_2 (Swarna Neelima) in the case of the alternative approach of E_2C_1 [*Enriched Sanjeevani* (1%) + Homa Induction (*Agnihotra*)] growing condition. From this finding, it may be concluded that the variety V_2 (Swarna Neelima) is highly suitable for the organic farming through the alternative growing condition of E_2C_1 [*Enriched Sanjeevani* (1%) + Homa Induction (*Agnihotra*)] in the south Chhotanagpur plateau of eastern India especially in Jharkhand.

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