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EFFECT OF STONE CRUSHER DUST ON ENERGY STRUCTURE OF *Oryza Sativa L.*

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ABSTRACT

The present research paper deals with effect of stone crusher dust pollution on energy structure of *Oryza sativa L.* at Pakur, Jharkhand. Maximum total standing crop of energy of *Oryza sativa L.* was recorded 7826.50 Kcal/m^2 (Control) and 6114.97 Kcal/m^2 (Polluted) at the age of 120 days.

Keywords: Energy Structure, Stone Crusher Dust, *Oryza sativa L.*

INTRODUCTION:

The energy content of plant material depends upon the quality and quantity of organic compound it contains. The energy of a plant is governed by its genetic constitution, stage in the life-history and nutritive status, specially the fat content. The first step of energy transformation is the capture of solar energy by green plants and its storage in the form of chemical energy, which forms the primary source of calorific need of the consumers (Odum 1962), Long (1934), Golley (1961), Leith (1968) and Malone (1968), Singh and Ambasht (1975), Pandey and Sant (1979), Sinha (2001), Kumari (2002), Scott *et al.,* (2003) found the varying colorific values with in a plant species at one site during a single growing season. The present study deals with effect of stone crusher dust pollution on energy structure of *Oryza sativa L.*

MATERIAL AND METHODS:

The study area was situated in the vicinity of stone crusher area of Pakur, Jharkhand, India. *Oryza sativa L.* is grown by villagers in the vicinity of stone crusher. Dust load was estimated at different distance (1 to 2 km) away from emission source in prevailing wind direction (SW-NE) by dust collection jar method (Rao, 1971). Seeds of *Oryza sativa L.* were sown in an area of 30m x 30m at a distance of 100 m in the North east direction of stone crusher in the third week of June, 2013 treated as polluted crop. The second plot was selected at a distance of 1000 m where dust load was zero and this *Oryza sativa L.* crop was treated as the dust free zone *i.e.,* control site. The climate is typically monsoonic which is characterized by three distinct seasons *i.e.,* rainy, winter and summer. The rainfall, relative humidity, minimum and maximum temperatures of the study period of 2013-2014 is shown in Table 1. The plant samples were collection from control and polluted plots after 15 days of sprouting of seedling. At each sampling date five plants were selected randomly and dug out individually upto a maximum depth of root *i.e.,* 30 cm. Monoliths of sampled plants were washed to remove soil from the root system. Sampled plants were cut out to sepa-

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Table 1: Meteorological data of Pakur, Jharkhand (2013-2014).

Month	Temperature (^{O}C)		Relative Humidity (%)		Rainfall
	Min.	Max.	9 A.M.	16 P.M.	(mm)
July	25	33	79	73	508
August	27	32	82	79	270
September	26	32	79	76	111
October	23	32	72	59	58
November	16	29	63	49	23
December	12	25	69	41	59
January	12	24	69	52	12
February	14	26	63	44	05
March	19	33	45	29	03
April	23	38	43	26	09
May	26	40	57	38	97
June	27	37	72	56	252

rate their component parts *i.e.,* shoot and root. Plants parts were dried in an oven at 80^{0} ± 10C for 48 hours. The average dry weight of plants was taken and total biomass was expressed in g/m^2. The standing state of energy structure was calculated by multiplying calorific value of different parts of *Oryza sativa L.* on control and polluted sites with respective biomass and the values are expressed in Kcal/m^2.

RESULTS AND DISCUSSION:

The maximum standing crop of energy in stem on control and polluted sites of *Oryza sativa L.* was recorded 2827.63 Kcal/m^2 (control) at 90 days and 2371.38 Kcal/m^2 (polluted) sites at the age of 120 days. Maximum standing crop of energy in root on control and polluted sites of *Oryza sativa L.* was recorded 986.54 Kcal/m^2 (control) and 689.64 Kcal/m^2 (polluted) sites at the age of 120 days. The total energy structure on control site was recorded more than polluted site at different ages of growth in *Oryza sativa L.* (Tables 2 and 3). The energy content of the different parts of *Oryza sativa L.* on control and polluted sites varies with age and environmental factors. Low temperature favours the synthesis of fat

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Table 2: Standing crop energy Kcal/m² of different component of *Oryza sativa L.* on control site.

Age (Days)	Stem	Leaf	Flower/Fruit	Standing dead	Root	Total
15	62.27	199.07	-	-	43.60	304.94
30	110.24	265.03	-	-	78.01	453.28
45	441.21	491.66	-	-	242.97	1175.84
60	715.68	686.15	-	-	268.26	1670.09
75	935.61	1428.65	-	-	506.34	2870.60
90	2727.24	1801.84	673.99	-	549.13	5752.20
105	2827.63	1794.18	1571.44	-	586.84	6780.09
120	2434.96	2014.93	2076.06	314.01	986.54	7826.50
135	2059.64	1771.34	1710.35	509.25	707.42	7758.00

following decrease in carbohydrate (McNair, 1945) and this may be one of the reason for higher energy value in different parts of *Oryza sativa L.* on control than polluted sites. Energy accumulation pattern of different parts of *Oryza sativa L.* on control and polluted sites changes with developmental stages. Obviously the age of the plant affects the dry matter production which may finally determine the energy storage in different parts of the *Oryza sativa L.* on control and polluted sites at various stages of growth. It shows that stone crusher dust at Pakur, Jharkhand reduces the energy concentration and accumulation of *Oryza sativa L.*

Table 3: Standing crop energy Kcal/m² of different component of *Oryza sativa L.* on polluted site.

Age (Days)	Stem	Leaf	Flower/ Fruit	Standing dead	Root	Total
15	50.04	162.10	-	-	36.28	248.42
30	91.87	210.16	-	-	64.51	366.54
45	341.17	392.00	-	-	178.31	911.48
60	573.83	583.74	-	-	198.67	1356.24
75	761.05	920.47	-	-	349.53	2031.05
90	1818.16	1189.08	368.92	-	425.53	3801.69
105	1926.18	1102.50	1083.37	-	467.18	4579.23
120	2371.38	1094.83	1705.71	253.41	689.64	6114.97
135	2024.03	961.47	1978.05	425.22	617.04	6005.81

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