Original Research Article www.ijbasr.org.in ISSN : 2349-1965
Peer Reviewed and Refereed Journal Impact factor 0.9 2016; 3(2); 202-205
International Journal of Basic & Applied Science Research

EFFECT OF STONE CRUSHER DUST POLLUTION ON BIOMASS AND PRIMARY PRODUCTIVITY OF *Sorghum vulgare L.*

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ABSTRACT

The study area was confined in the prevailing wind direction of stone crusher of Pakur, Jharkhand (23040' to 25018' North latitude and 860 15'to 870 57' East longitude) to know the effect of stone crusher dust pollution on Biomass and primary productivity of *Sorghum vulgare L.* Biomass and primary productivity were comparatively lower in polluted *Sorghum vulgare L.* than control one.

Keywords: Stone crusher dust, Biomass, Primary Productivity, sorghum vulgare L.

INTRODUCTION:

Air pollution by particulate matter is caused by variety of industrial and other activities including transportation, construction, stone crushing, agricultural related operations and forest product processing. The particles that are dispersed into the air depending on their size and weight may remain in air for varying length of time. The effect of particulates on plants has been summarized by Lerman and Darley (1975), Bose *et al.,* (1983). Among the particulate air pollutants in the vicinity of stone crusher dust areas, there is deposition of stone crusher dust on leaf surfaces of plants growing in the vicinity of the area. The present study deals with effect of stone crusher dust pollution on biomass and primary productivity of *Sorghum vulgare L.*

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Date of Acceptance : 25.05.2016
Date of Publication : 30.09.2016

MATERIAL AND METHODS:

The study area was situated in the vicinity of stone crusher, Pakur, Jharkhand, India (230 40' to 250 18' North latitude and 860 15' to 87o 57' East longitude). Jowar is grown by villagers in the vicinity of stone crusher. Dust load was estimated at different distances (1 km to 2 km) away from emission source in the prevailing wind direction (SW - NE) by dust collection Jar Method (Rao, 1985).

Seeds of jowar were sown in an area of 30 m x 30 m at a distance of 100 m in the northeast direction of the stone crusher of Pakur, Jharkhand in the last week of June 2013 treated as polluted crop. The soil of the field was dug, pulverized and well manured. The second plot was selected

away from stone crusher where dust load was zero and this jowar was treated as control. The samples were collected from both control and polluted plots at the age of 15,30,45,75,90,105, 120 and 135 days intervals from the date of sowing. Biomass and primary productivity was estimated as method given by Misra (1968).

RESULTS:

It is clear from Table 1 that any stage of *Sorghum vulgare. L.* the biomass values of polluted plants were lower than those of control one. The maximum values were recorded at the age 135 days i.e. 296.08 g/m2 (control) and 213.50 g/m2 (polluted). The net primary productivity has been expressed as g/m2/day was maximum for 105 days old plant *i.e.,* 7.472g/m2/day (control) and 4.003 g/m2/day (polluted) plots at the age of 90 days (Table1). It was negative production at the age of 135 days on both sites in *Sorghum vulgare L.* (Table 2 & 3)

Table 1 : Total plant biomass, mean and current increment biomass of Sorghum vulgare on control and polluted sites.

Age (Days)	Total biomass (g/m^2)		Mean increment ($g/m^2/day$)		Current increment ($g/m^2/day$)	
	Control	Polluted	Control	Polluted	Control	Polluted
15	1.61	1.61	0.107	0.107	-	-
30	3.84	3.11	0.128	0.104	0.148	0.100
45	8.92	7.44	0.198	0.165	0.338	0.288
60	47.39	40.24	0.789	0.670	2.564	2.186
75	100.03	66.09	1.333	0.881	3.509	1.723
90	150.15	126.14	1.190	0.713	3.341	4.003
105	262.24	180.44	2.497	1.718	7.472	3.620
120	290.25	216.37	2.418	1.803	1.867	2.395
135	296.08	213.50	2.193	1.581	0.388	-0.191

Table 2: Net primary productivity (g/m²/day) of *Sorghum vulgare* at various stages of growth period on control site.T

Age (Days)	Shoot (S)					Root (R)	Total (S+R)
Stem	Stem	Leaf	Infl/Fruit	S.D.	Total		
15	0.036	0.032	-	-	0.068	0.038	0.106
30	0.057	0.038	-	-	0.095	0.053	0.148
45	0.144	0.064	-	-	0.200	0.130	0.330
60	1.222	0.892	-	-	2.114	0.449	2.563
75	1.375	1.663	-	-	3.038	0.470	3.508
90	1.334	4.297	0.009	0.008	5.648	0.288	5.936
105	9.243	0.772	0.144	0.055	10.214	1.428	11.642
120	0.367	0.115	0.974	0.046	1.502	0.036	1.538
135	-0.833	-0.751	1.994	0.118	2.739	-0.139	-0.389

Table 3: Net primary productivity (g/m²/day) of Sorghum vulgare at various stages of growth period on polluted site.

Age (Days)	Shoot (S)					Root (R)	Total (S+R)
Stem	Stem	Leaf	Infl/Fruit	S.D.	Total		
15	0.036	0.032	-	-	0.068	0.038	0.106
30	0.038	0.022	-	-	0.060	0.038	0.098
45	0.116	0.072	-	-	0.188	0.100	0.288
60	1.002	0.725	-	-	1.915	0.458	0.373
75	0.594	0.782	-	-	0.1376	0.347	1.723
90	1.884	1.906	0.008	0.007	3.805	0.124	3.929
105	1.682	0.294	0.135	0.052	2.163	1.455	3.618
120	1.850	-0.223	0.545	0.038	2.210	0.185	2.395
135	-0.545	-0.416	0.777	0.112	-0.072	-0.112	-0.184

DISCUSSION:

The biomass values and net primary productivity in polluted *Sorghum vulgare L.* were constantly lower than those plants at all stages of growth and development. The maximum biomass of 296.08g/m^2 for 135 days old polluted plant was 27.89 percent lower than the biomass of control plants of the same age which indicated a reduction of photosynthesis in polluted plants. This reduction in biological yield of polluted plants could be attributed to the stone crusher dust which possibly affected the metabolism of plant in several ways. Thus, several extra and intercellular changes in leaf of *Sorghum vulgare L.* may cause serious metabolic interference in polluted plant leading to reduction in biomass and productivity (Pandey *et. al.,* 1991)

ACKNOWLEDGEMENT:

Authors are thankful to the Principal, S.M.D College, Punpun for providing library and laboratory facilities.

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