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PERIODICAL EFFECT OF CEMENT DUST POLLUTION ON CHICKPEA IN THE VICINITY OF BANJARI CEMENT FACTORY

Dr. Rajesh Kumar
Department of Botany,
V. K. S. University, Ara (Bihar)

Abstract

The present work has been carried out under the impact of cement dust pollution in the vicinity of Banjari cement factory. The selected crop cicer arietinum have been studies which grow under cement dust pollution Result of effect revealed to undergo stages of growth as compare to control crop.

Cement dust emitting from cement factory is essentially an inorganic mixture of oxide potassium, aluminium, silicon and sodium. These elements to change the physical and chemical properties of soil which is directly or indirectly they effect the normal growth of plant as well nutritive value of seeds.

Keyboard: Cement dust pollution cicer arietinum, NPK, cultivated Yield.

Introduction

The present investigation was carry out in the vicinity of Banjari Cement factory, Rohtas, Bihar where gram, i.ecicer arietinum is being cultivated as rabi crop large quantities of cement dust, emitted in the area around the factory during crushing and pulse rising of raw materials as well as during packing, loading and transporting of cement bag constitute a major threat to crop of this area. Cement dust emitting from a cement factory is essentially in inorganic mixture of oxides of calcium, potatssium, silicon and sodium these pollutants are found to adversely effect the standing crop biomass primary productivity, nutrient dynamics and enargetics. Strateman and Van Hant (1986) Shonbeck (1990) stated that dust falling on the soil caused shift in pH to the alkaline side so after the chemistry of soil.

Methods

For sampling of the cement dust, dust fail jars were used for settled dust and high volume sampler for suspended particles and similarly the foliar surface can be measured by collective dust fail in an area.

The first sampling of cicer arietinum was done after 15 days and 30 days of the emergence of seeding. At each sampling date five plants were selected randomly and were dug out individually upto a depth of 30 cm. Plants were selected randomly and were dug out individually upto a depth of 30 cm. Plants were dried out in oven at 80^{0} c for 48 hrs. The dried samples were weighed to estimate the biomass which were expressed in gm/cm^{2} similarly, the methods suggested by William (1970) and Misra (1962) were used to estimate the nitrogen and phosphorous contents in gram plants, Jackson (1962) methods was used to measure potassium sodium and calcium amount in plants.

Results and Discussions

Plants samples were collected from control and polluted sites. The polluted site was elected in the north east direction of cement factory where dust load was zero. It was carried out during the period of 2011-12.

Seeds of gram were sown in rows in 4th week of October in the control and polluted sites. The samples were collected from both the sites at the age of 15, 30, 45, 60, 75 and 90 days internal from the date of sowing. The data collected were placed in the following table:

Table 1 : Mean Standing crop biomass (g/m^2) of cicer arietinum on control site

Age (Days)	Aboveground				Total	Under ground	Above ground & Under ground
	Stem	Leaf	Flower pod	Standing Dead			
30	0.98	1.6	-	-	2.61	0.80	3.41
	±0.21	±0.24	-	-	±0.45	±0.09	±0.54
60	1.68	3.19	5.01	-	9.88	1.34	11.22
	±0.36	±0.32	±0.71	-	±1.39	±0.20	±1.59
90	4.23	35.94	10.45	-	50.62	3.16	53.68
	±0.96	±6.08	±1.72	-	±8.76	±0.53	±9.29
120	12.09	96.71	60.02	-	168.82	10.33	179.15
	±2.88	±16.39	±11.36	-	±30.63	±1.82	±32.45
150	15.67	172.60	100.37	43.45	332.09	30.72	362.81
	±3.74	±29.23	15.01	±7.77	±55.75	±4.87	±60.62

Table 2 : Mean standing crop biomass (g/m^2) of cicer arietinum on polluted site

Age (Days)	Aboveground				Total	Under ground	Above ground & Under ground
	Stem	Leaf	Flower pod	Standing Dead			
30	0.74	1.26	-	-	2.00	0.58	2.58
	±0.09	±0.17	-	-	±0.26	±0.06	±0.32
60	1.30	2.50	3.84	-	7.64	0.96	8.60
	±0.20	±0.29	±0.58	-	±1.07	±0.12	±1.19
90	3.26	28.10	8.16	-	39.52	2.23	41.75
	±0.44	±5.57	±1.44	-	±7.45	±0.31	±7.76
120	9.56	75.49	46.88	-	131.93	7.49	139.42
	±1.47	±11.33	±8.67	-	±21.47.63	±1.37	±22.84
150	12.25	134.82	78.10	31.49	256.96	22.27	279.23
	±2.15	±24.20	15.65	±5.01	±47.01	±3.29	±5.03

Conclusions

On the basis of this study it may be concluded that cement dust produces deleterious effects on growth and development of pulse yielding plants i.ecicer arietinum. The cement dust affects the plants through encrustation of leaves, plugging of stomata, changes in quantum of light absorbed by leaves, change in pH both outside and inside of the leaf as well as through modification in soil condition. So, the above finding concludes the gram could suffer a loss in size and in terms of both quality and quantity in cement dust polluted area.

Conflicts of interest

Similarly the level of nitrogen, phosphorus, potassium, sodium and calcium in polluted plants at given age were less comparing to those in controlled plants. Perhaps the abundance of Ca++ions in cement dust affected soil decreases the nitrogen availability to plants (Demooy& Pesak1966). Excess calcium in soil may capture potassium and form calcium triphosphate and rendering it unavailable to plants (Devling 1975). Further, a possible incorporation of these cations through leaf surface could increasethere levels in polluted plants. (Bukovac&Wittwer S.H. 1957), (Levi, 1970), (Mc Farmland, J.C) and (Mc Farmland, 1971).

Acknowledgements

The cement dust after hydration and crystallization forms a hard on surface vegetation. It is already known that such a crust upset the growth and development of plants (Peirce 1909, Parish 1910, Czajal 1962). It was noted that the relative thickness of cement crust on gram plants from dusted to controlled sites was reduced. The crust occasionally got peeled off together with the cuticle exposing the dark green layer underneath. The incorporation of cement dust suspension containing Ca $(OH)_2$ Al $(OH)_3$ into the leaf tissue increase the pH of leaf tissue.

The biomass and primary productivity in polluted gram plants were constantly lower than those of controlled gram plants at all stages of growth and development. This reduction in the biological yield of polluted plants could be attributed to the cement dust which possibly affected the metabolism of gram in several ways.

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