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RESEARCH ARTICLE

Effect of Municipal Solid Waste on Germination of Ricinus communis L. in Dump Sites Meerut, Uttar Pradesh

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ABSTRACT

The life span of seed initially starts with the water absorption; results with the emergence of roots to germinate (visualized in the germination percentage data's). The plant primary adapts and establishes him in stress. Therefore, initial life pattern in germination percentage played a significant role to study the tolerance of *Ricinus communis* in various sites of municipal solid waste. Thus, germination percentages in the life of a Ricinus communis play a significant role in toxic conditions. The physiology of germinating seeds gets disturbed in IW (industrial waste) toxic site. The chemical and physical structure of disturb in cow buffalo waste and industrial waste site. The inadequate water availability, absorption, slow metabolism resulted with a poor and delayed germination percentage, seedling growth. Toxic metallic ions absorbed by root system either through in water / inorganic complex facilitate in the soil system. In the experimental findings of germination emergence time and seedling, behavior showed a significant toxic pattern. In the observed data, which clearly depict the pattern of toxicity in two categories? One in moderate toxicity limits of MSW soils (in MMSW –T.P.N.W. experimental sites) other in high toxic sites (IW site). The pattern of germination was in enhanced way of physiological characters in MMSW, JRN, HRRL comparison to control soil data.

KEYWORDS

Ricinus communis, Germination, Municipal Solid Waste, Meerut.

INTRODUCTION

Municipal solid waste (M.S.W.) include garbage and rubbish materials from households, hotels, offices, markets etc. and also the street, big drains such as sweepings silt and dirt, leaves, contents of litter receptacles etc, apart from these other special wastes are also encountered like ashes, cinders, dead animals, dairy, cattle animals dung, and septic tank sludge etc. Different types of industries produce large quantities of solid wastes. In Meerut M.S.W. generation approximately is around 1200 mt/day.

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The solid waste disposal is not thoroughly systematic and the solid waste dumps are different in low-lying areas. This MSW is collected where is ultimately roads loaded in sanitary landfill areas of Kamela (opposite Karim Nagar), a place outside the Meerut municipal areas in Lohia Nagar, Hapur road and Delhi Road, near Kustha Ashram. There is no proper system of monitoring the dumping activities. It is estimated that there are approximately 14000 registered industries in the Meerut city out of which only about 9000 units are functioning. Industries are located in Mohkampur, Udyog Puram, Sports Complex and Partapur industrial area, Distillery, small scale industries live sports goods, chemical, medicines, food processing, surgical goods, engineering works,

petrochemicals, rubbers, plastic, leather goods, flour miles and readymade garments industries are predominating in Meerut. Industrial pollution is caused by the discharge of a variety of industrial pollutants in the form of gasses, liquids, and solids which affect the physical, chemical and biological conditions of the environment and are detrimental to human health, fauna, flora and soil properties. **According to Rasid (1993)** a high cost and scarcity of chemical fertilizers, the land disposal of agricultural, municipal and industrial wastes is widely practiced as a major and economic source of nutrients and organic matter for growing crops by poor farmers. Several heavy metal based pesticides are used to control the diseases of grain and fruit crops and vegetables, are sources of heavy metal pollution to the soil. **(Verkleji, 1993).** The accumulation of contaminants is aided by the capability of soil to bind them with clay minerals or organic substances. Their accumulation has multiple effects on the usability and functions of soil in the eco-system. **(Nielsen, 1997). Kansal *et al.*, (1998)** reported that MSW (Municipal Solid Waste) is normally disposed of in an open dump in many Indian cities and towns, which is not the proper way of disposal because such crud dump creates environmental hazards causing ecological imbalances with respect to land, water, and air pollution. *Ricinus communis* (L), Plant primarily adapt and establish him in the polluted soils. The natural phase of seedling growth is directly being affected in the environment, in the accelerating way of growth/reduction in higher toxic levels to overcome the barriers of stress. The germination and early seedling growth, because of initial primary phase in the survival of plant species, therefore can be an important tool for the study of tolerance behavior in contaminated soils. Main advantage associated with a research study of castor bean *(Ricinus communis* L.) plants including non-edible crops, is their ability as hyperaccumulator of toxic metals. It's grown on polluted land irrigated with polluted water. Thus, plants can serve as a good tool for Phytoremediation. However, determination of the nature of toxicity distribution of toxicants and level of accumulation in different parameters. The castor oil plant (Hindi was known as Arand) *Ricinus communis* L., is a member of the Euphorbiaceae. Castor bean is a native of tropical Africa but has naturalized in moist tropical and subtropical regions throughout the world. The seeds contain approximately 46- 60% oil and are the only commercial source of ricinoleic acid that is used as industrial lubricants, paints, coatings, and plastics. The oil has great promises in the field of biodiesel production. Besides being used as a source of biodiesel, the oil can also be used for manufacturing candles, soaps and cosmetics. Physio-morphological observation was being taken following toxic sites seed germination percentage of castor bean plants, Castor bean (*Ricinus communis* L.), and act as hyperaccumulator plant for municipal solid waste. It is a pollution indicator plant.

MATERIALS AND METHOD

The present study was carried out at B – 16, Jwala Nagar, Ambedkar Chock in District Meerut for the period MAY to JULY year 2010 and confirmation year 2011 in 20 kg cemented pots. The matured and healthy seeds were collected from Hastinapur Meerut, Uttar Pradesh during the mid-April 2010.

SN	Sites	Location
1.	Control	Put the village
2.	M.M.S.W.	Mixture of all sites MSW (refuse soil)
3.	J.R.N.	Jail Road Nullaha near Arya Nagar
4.	H.R.R.L.	Hapur Railway line Uttam Nagar
5.	L.D.S.	Lohia Nagar Hapur road
6.	D.A.	Household ash(Nai Basti)
7.	T.P.N.W.	Transport Nagar, Baghpat road
8.	C.B.W.	Gupta colony
9.	I.W.	Industrial area - Partapur

The total 900 seeds were sown in 09 cemented posts such as one pot C (Control) and eight pots containing municipal solid waste MMSW (Mixture municipal solid waste that is mixture of

other 7 waste soil samples), JRN (Jail roar all), HRRL (Hapur railway line), LDS (Lohia Nagar dump site), DA (Domestic area waste), TPNW (Transport Nagar all a waste), CBW (Cow and buffalo waste), IW (Industrials waste). Germination commenced started within three days after sowing and total 100% germination was observed within 21 days in the month of July. Given the below table dump sites of Meerut,

RESULTS AND DISCUSSION

The result shows that the total seeds germinated 100 percent in MMSW, JRN, and HRRL at July 2011 within 18 days. In present sets of experimental findings (Table 1-2, Fig-1 – 2 and photographs). Toxic stress in the time of emergence and germination percentage can be categories in two levels, a moderate level and other is high toxic level. MSW refuse organic soil is categories in moderate level (Soils-MMSW, J.R.N, HRRL, LDS, DA, T.P.NW), and a slight toxic level in CBW and high toxic level Industrial waste site of Partapur area (I.W).As perusal of germination data (Table 1-2) the time of emergence in MSW- moderate level soils samples is required 3-21 days in the month of June- July, as the availability of soil water increases in July (rain) the osmoregulation system of castor bean seeds germination process, got accelerated, therefore, time of emergence increased from 3 to 18 days in moderate soils samples. In toxic soils of Partapur industrial waste and in cow buffalo waste (CBW), time of emergence decreased up to 09, days. This is because of excessive ions slightly the influx disturb the osmoregulation system in germination process, therefore, a slightly greater time is required in higher doses (in comparison with the moderate time required 3-6 days).

Time of emergence is related with germination process with a visual appearance of germination percentage was recorded in an enhanced way in moderate toxicity level from July (10-100% in comparison with control. In higher toxicity levels (C.B.W, IW), an apparent reduction germination percentage was observed, which was due to the fact that disturb osmoregulation system significantly affected germination percentage up to a certain limit. Therefore, reduction in germination percentage was reported in toxic levels. In the confirmatory year of 20010, the pattern of time emergence and germination enhancement was similar. However, time of emergence and greater germination percentage was observed in all levels of toxicity. In the confirmatory year of 2011results clear (Table 1-2 fig 1-2 and photographs),. (Roe and Kostewicz, 1992) reported the retarded rate of germination percentage in industrial ash. (Sharifi *et al.*, 2007) observed the reduced rate of germination in contaminated soils. Second further, in toxic soils of the industrial waste site of Partapur and CBW, a significant reduction was observed in all parameters like as germination, seedling length, fresh and dry weight. The findings of data (Fig 1 – 6 and photographs) got support from work of (Roe and Kostewicz, 1992; Sharifi, *et al.*, 2007; Asgharipour, *et al.*, 2010; Gautam, 2010). The physiology of germinating seeds gets disturbed in IW (Industrial waste) and CBW. The inadequate water availability, absorption, slow metabolism resulted with a poor and delayed germination percentage, seedling growth. Toxic metallic ions absorbed by root system either through in water / inorganic complex facilities in soil systems. Municipal solid waste is the major problem being faced by municipalities because it involves a huge expenditure. (Bhide and Sundersan 1983; Dowdy, R.H; Epstein 1976). Roe and Kostewicz (1992) studied MSW technology in recent advances in municipal solid waste technology have resulted in new commercial products derived from household garbage, horticultural waste, and other organic sources. Field conditions as soil amendments concluded that improper municipal solid waste doses can retard germination in crops. Vavina (1994) observed that municipal solid waste retarded seedling emergence, which further resulted in reduced plant height within six weeks after seedling growth. These effects continued in the field, causing delayed fruit maturity and lower fruit production at first harvest when compared to plants grown in Metro Mix. Asgharipour and Armin (2010) said that the application of

municipal compost to agricultural soil can be helpful to solve municipalities problem related to the ever-increasing production of waste. Compost has been identified as an alternative chemical fertilizer to increase soil fertility and crop production. In this study, the capacity of the compost made from urban wastes to enhance seedling emergence grown in potting soil was investigated. Gautam *et al.*, (2010) reported the Inhibition of seed germination and plant injuries with the application of fresh or partially composted wastes to soil. Mathur *et al.,* (2010) demonstrated that *T. arjuna* provides a successful Phytoremediation process of a contaminated desert soil Rashad and Shalaby, 2007; Hampton, 1994; Violeta, 2001; Vwioko, *et al.,* 2005; Anonymous, 2000; Causton, *et al.,* 1981; Anoliofo, 2001; Marques, *et al.,* 2010, studied the various parameters of growth analysis in different plants species, got the similar results and inference of data plants in of various toxic sites of MSW soils. Phytoremediation for contamination toxic soils through the potential of tropical plants is among the fast growing areas of environmental remediation research, technology development and implementation (Dzantor, *et al.,* 2002; Merkl, *et al.,* 2007). Plants capacity to germinate for producing biomass in presence of contaminant is varied necessarily. However, tolerance to the soil contamination, to some extent followed by Phytoremediation capacity or Phyto-toxicity which can be defined any change in the development of native or cultivated species, due to the presence of toxicity in soil (OECD 1984). Therefore, initial life pattern in germination and seedling growth played a significant vegetative growth than control soil.

June 2011

Table: 1

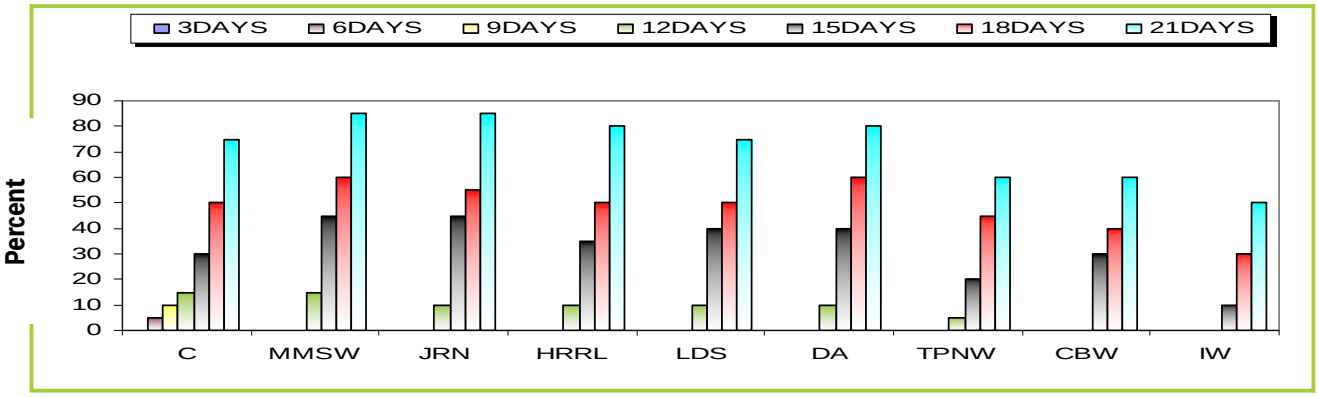
S.No.	Treatment	Days							Germination%						
1.	C	3	6	9	12	15	18	21	-	-	-	5	30	50	75
2.	M.M.S.W.	3	6	9	12	15	18	21	-	-	-	10	45	60	85
3.	J.R.N.	3	6	9	12	15	18	21	-	-	-	5	45	55	85
4.	H.R.R.L.	3	6	9	12	15	18	21	-	-	-	5	35	50	80
5.	L.D.S.	3	6	9	12	15	18	21	-	-	-	5	40	50	75
6.	D.A.	3	6	9	12	15	18	21	-	-	-	5	40	60	80
7.	T.P.N.W.	3	6	9	12	15	18	21	-	-	-	-	20	45	60
8.	C.B.W.	3	6	9	12	15	18	21	-	-	-	-	15	40	60
9.	I.W.	3	6	9	12	15	18	21	-	-	-	-	15	30	50

July 2011

Table: 1

June - 2011

S.No.	Treatment	Days							Germination %						
1.	C	3	6	9	12	15	18	21	-	5	50	75	80	85	95
2.	M.M.S.W.	3	6	9	12	15	18	21	-	10	60	70	80	90	100
3.	J.R.N.	3	6	9	12	15	18	21	-	5	60	65	70	90	100
4.	H.R.R.L.	3	6	9	12	15	18	21	-	5	50	60	70	80	100
5.	L.D.S.	3	6	9	12	15	18	21	-	5	50	60	70	80	100
6.	D.A.	3	6	9	12	15	18	21	-	5	60	60	70	80	100
7.	T.P.N.W.	3	6	9	12	15	18	21	-	5	40	50	55	60	70
8.	C.B.W.	3	6	9	12	15	18	21	-	-	10	20	30	35	60
9.	I.W.	3	6	9	12	15	18	21	-	-	10	30	25	40	60



Treatment

Figure 1 Percent germination of seeds of *Ricinus communis* (Castor bean) sown in various toxic site of Municipal Solid Waste.

July - 2011

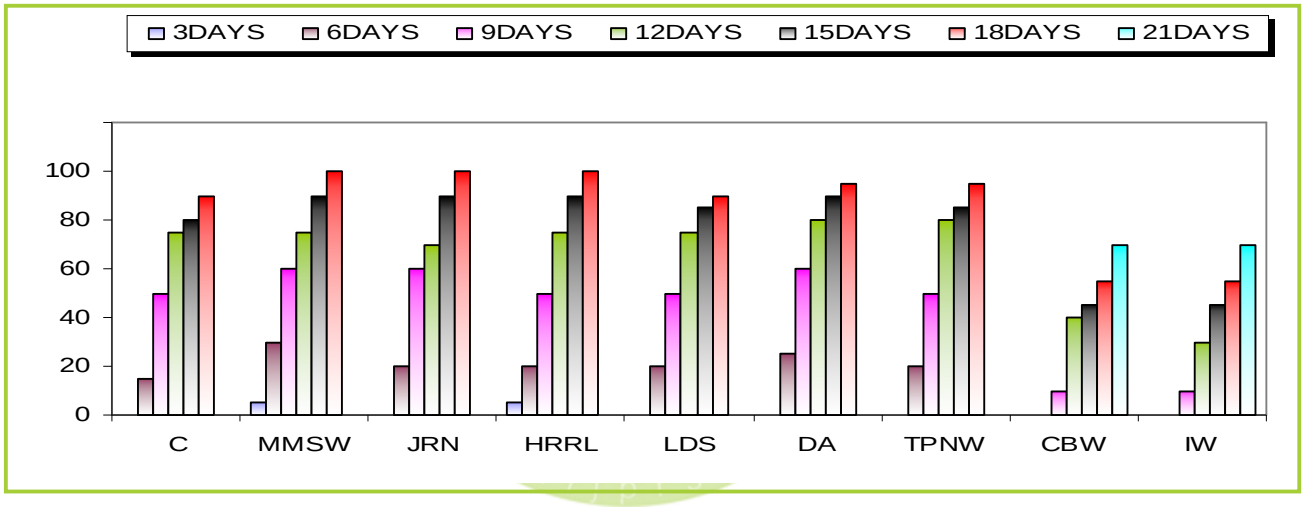
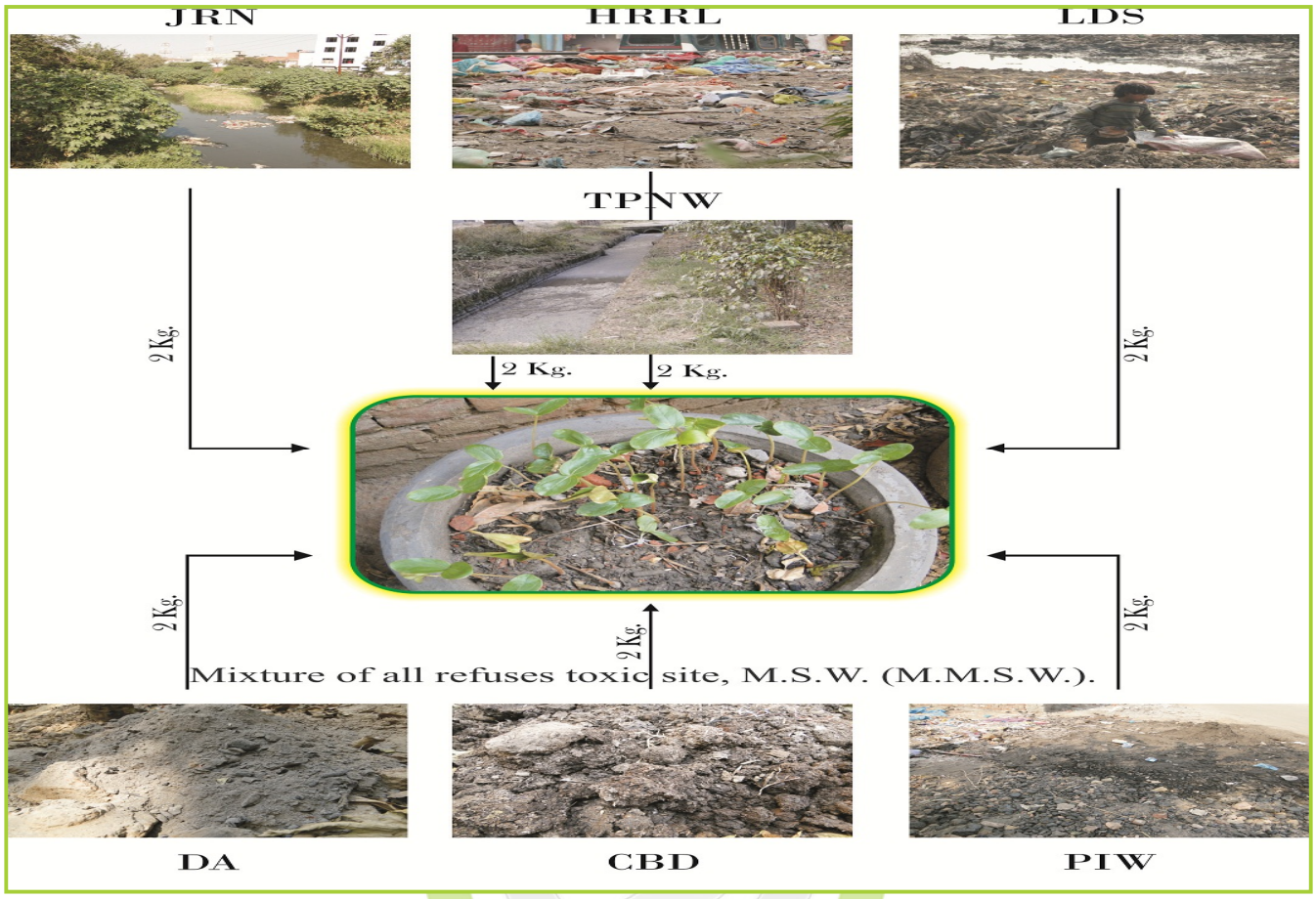


Figure 2 Percent germination of seeds of *Ricinus communis* (Castor bean) sown in various toxic site of Municipal Solid Waste.

Seeds of *Ricinus communis*

View of germinate seed in municipal solid waste



CONCLUSION

It is concluded that the aim of the present study is to spread awareness towards contaminated soil improvement and polluted ground water improvement in those areas where the dump site. This research work will also prove to be of immense usefulness for the pollution free environment. Since this *Ricinus communis* plant is beneficial for humans in many ways, therefore it is required that wide green belt for dump site.

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