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Research Article

STUDIES ON THE GERMINATION AND GROWTH OF NEEM (*AZADIRACHTA INDICA*) AND HONGE (*PONGAMIA PINNATA*) SEEDS IRRIGATED BY DISTILLERY SPENTWASH

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ABSTRACT

Germination of Neem *(azadirachta indica)* and Honge *(pongamia pinnata)* seeds was made by irrigated with distillery spentwash of different concentration. The spentwash i.e. primary treated spentwash [PTSW] 1:1, 1:2 and 1:3 spentwash were analyzed for their plant nutrients such nitrogen, phosphorous, potassium and physical and chemical characteristics. Experimental soil was tested for its physico-chemical parameters. Neem and Honge seeds were sowed in the prepared land and irrigated with raw water (RW), 1:1, 1:2 and 1:3 spent wash. The nature of germination and growth of seeds was studied. It was found that, the germination as well as growth was good (100%) in 1:3 SW irrigation, while very poor in 1:1 SW (25%), moderate in 1:2 SW (80%) and 95% in RW irrigation.

Key words: Distillery Spentwash, Neem, Honge, Seeds, Germination, Irrigation, Soil.

INTRODUCTION

Neem *(Azadirachta indica)* oil is a vegetable oil pressed the fruits and seeds of neem an evergreen tree, which is endemic to the Indian subcontinent and has been introduced to many other areas in the tropics. It is perhaps the most important of the commercially available products of neem for organic farming and medicines. Neem oil is generally light and dark brown, bitter and has a rather strong odor that is said to combine the odor peanut and garlic. Neem oil is used for preparing cosmetics, soaps, hairs products, ceramics etc. the most frequently reported indications in ancient ayurvedic writings are skin diseases, inflammations and fevers malaria and tuberculosis. and more recently rheumatic disorders, insects repellent and insecticide effects[1,2]

Honge *(pongamia pinnata)* A legume tree that grows about 15-25mt in height with large canapy, this spreads equally wide. The naturally distributed in tropical and temperature Asia from India to Japan and north-eastern Australia and some pacific islands. Pongamia plants are tolerant to water logging, saline and alkaline soils and can with stand harsh climate. It is often used for land scalping purposes as a wind break, and seeds also used many traditional remidies[3]. Oil is also used in soap making and lubricant[4]. The oil is applied to skin diseases. And also find wide usage as a bio-pesticide for organic farming, as it repel a wide variety of pests Internally the oil has sometimes been used as a stomach and chologogue in case of dyspepsia with sluggish liver[5]

Molasses (one of the important byproducts of sugar industry) is the main source for the

production of Ethanol in distilleries by fermentation method. About 08 (eight) liters of waste water is generated for every liter of ethanol production in distilleries, known as raw spentwash (RSW) which is characterized by high biological oxygen demand (BOD:5000-8000 mg/L) and chemical oxygen demand (COD :25000-30000mg dangerous /L)[6] undesirable color. Discharge of raw spentwash into open land or nearby water bodies is, since it results in number of environmental, water and soil pollution including threat to plant and animal lives. The RSW is highly acidic and contains easily oxdisable, organic matter with very high BOD and COD[7] .Also, spent wash contains high organic nitrogen and nutrients[8], By installing biomethenation plant in distilleries, reduces the oxygen demand of RSW, the resulting spentwash is called primary treated spent wash(PTSW) and primary treated to RSW increases the nitrogen (N), phosphorous (P) and potassium(K) and decreases calcium (Ca), magnesium (Mg), sodium (Na), chloride (Cl^-), and sulphate[9] ,The PTSW is rich in potassium (K), sulphur (S), Nitrogen(N), Phosphorous(P), as well as easily bio degradable organic matter and its application to soil has been reported to increase the yield of sugarcane[10], rice[11] wheat, rice yield[12], quality of groundnut[13] and physiological response of soybean[14]. Diluted spentwash could be used for irrigation purpose without adversely affecting soil fertility[15-16], seed germination and crop productivity[17]The diluted spentwash irrigation improved the physical and chemical properties of the soil and further increased soil micro flora[18]. Twelve pre-sowing irrigations with the diluted spentwash had no adverse effect on the germination of maize but improved the growth[19]. Diluted spent wash increases the growth of shoot length, leaf number per plant, leaf area and chlorophyll content of peas[20] .Increased concentration of spentwash causes decreased seed germination, seedling growth and chlorophyll content in sunflowers (Helianthus annuus) and the spentwash could be safely used for irrigation purpose at lower concentration,[21,22] .The spent wash contained in excess of various forms of cations, anions, which are injurious to plant growth and these constituents should be reduced to beneficial level by diluting the spentwash, which can be used as substitute for chemical fertilizer[23,] the spentwash could be used as a compliment to mineral fertilizer to sugarcane[24].The spent wash contained N, P, K, Ca, Mg and S and thus valued as a fertilizer when applied to soil through irrigation with water[25]. The application of diluted spentwash increased the up take of Zinc (Zn), Copper (Cu), Iron (Fe), Manganese (Mn) in Maize and wheat as compared to control and the highest total uptake of these were found at lower dilution levels than at higher dilution levels[26] growth of cotton and groundnut leaves vegitables[27,28] Mineralization of organic material as well as nutrients present in the spent wash were responsible for increased availability of plant nutrients. However no information is available on the studies on the impact of irrigation of spentwash on the Germination and growth of Neem and Honge oil seed plants. Therefore, the present investigation was carried out to study the influence of different proportions of spentwash on Germination and growth of Neem and Honge seeds.

MATERIALS AND METHODS

Field work was conducted at own land in Halebudanur village near Mandya, Karnataka, India. Before cultivation, a composite soil sample was collected from experimental site at 25.cm depth at different sites, mixed and dried under sunlight. The sample was analyzed by standard procedures (Table-1). The PTSW was used for irrigation with a dilution of 1:1, 1:2 and 1:3 ratios. The physical and chemical characteristics and amount of nitrogen(N) Potassium(K), Phosphorous(P) and sulphur (S) present in the PTSW, 1:1, 1:2 and 1:3 distillery spentwash were analyzed using standard procedures (Table-2 and 3).

Neem and Honge oil seeds were selected for the present investigation. The seeds were sowed and irrigated (by applying 5-10 mm^3/cm^2 depends upon the climatic condition) with raw water (RW), 1:1,1:2 and 1:3 SW at the dosage of twice a week

and rest of the period with raw water depend upon the climatic condition. Three trials were conducted and average growth were recorded (Table-4).

RESULTS

Characteristics of experimental soils such as pH, electrical conductivity, the amount of organic carbon, available nitrogen(N), phosphorous(p), Potassium(K), sulphur (S), exchangeable calcium(Ca), Magnesium(Mg), Sodium(Na), DTPA iron(Fe), manganese(Mn), copper(Cu) and zinc (Zn) were analyzed and tabulated (Table-1). It was found that the soil composition is fit for the cultivation of plants, because it fulfils all the requirements for the growth of plants. Chemical composition of PTSW, 1:1,1:2 and1:3 SW such as pH, electrical conductivity, total solids (TS), total dissolved solids (TDS), total suspended solids(TSS), settelable solids (SS), chemical oxygen demand(COD), biological oxygen demand(BOD), carbonates, bicarbonates, total phosphorous(P), total potassium(K), ammonical nitrogen (N), calcium(Ca) magnesium(Mg), sulphur(S), Sodium(Na), chlorides(Cl), iron(Fe), Manganese(Mn), zinc(Zn), copper(Cu), cadmium(Cd), lead(Pb), chromium(Cr) and nickel (Ni), were analyzed and tabulated (Manivasakam,1987 Piper,1996) (Table-2). Amount of N, P, K and S contents are presented in Table-3.

The germination was good 100% in 1:3 SW, 25% in 1:1 SW, 80% in 1:2 SW and 95% in RW irrigations. Growth rate was very poor in 1:1 SW irrigation compare with RW, 1:2 SW and 1:3 SW irrigations. Maximum growth was observed in 1:3 SW compare to RW, 1:1 SW and 1:2 SW irrigations.

Table 1: Physico-Chemical Properties of Soil

Parameters	Values
Coarse sand [c]	9.85
Fine sand [c]	40.72
Slit [c]	25.77
Clay [c]	23.66
pH (1:2 soln)	8.41
Electrical Conductivity [a]	540
Organic Carbon [c]	1.77
Available Nitrogen [b]	402
Available Phosphorous [b]	202
Available Potassium [b]	113
Exchangable Calcium [b]	185
Exchangable Magnesium [b]	276
Exchangable Sodium [b]	115
Available Sulphur [b]	337
DTPA Iron [b]	202
DTPA Manganese [b]	210
DTPA Copper [b]	12
DTPA Zinc [b]	60

Units: a-ms, b: Mg/L, c-%

Table 2: Chemical Characteristics of Distillery Spentwash at different Dilution

Chemical parameters	PTSW	1:1 PTSW	1:2 PTSW	1:3 PTSW
pH	7.57	7.65	7.66	7.63
Electrical Conductivity	26400	17260	7620	5330
Total solids	47200	27230	21930	15625
Total dissolved solids [b]	37100	18000	12080	64520
Total suspended solids [b]	10240	5830	2820	1250
Settleable solids [b]	9880	4150	4700	3240
2140	4700	19036	41250	COD [b]
BOD [b]	16100	7718	4700	2430
Carbonate [b]	Nil	Nil	Nil	Nil
Bicarbonate [b]	12200	6500	3300	1250
Total Phosphorous [b]	40.5	22.44	17.03	10.80
Total potassium [b]	7500	4000	2700	1620
Calcium [b]	900	590	370	190
Magnesium [b]	1244.16	476.16	134.22	85
Sulphur [b]	70	30.2	17.8	8.4
Sodium [b]	520	300	280	140
Chlorides [b]	6204	3512	3404	2960
Iron [b]	7.5	4.7	3.5	2.1
Manganese [b]	980	495	288	160
Zinc [b]	1.5	0.94	0.63	0.56
Copper [b]	0.25	0.108	0.048	0.026
Cadmium [b]	0.005	0.003	0.002	0.001
Lead [b]	0.16	0.09	0.06	0.003
Chromium [b]	0.05	0.026	0.012	0.008
Nickel [b]	0.09	0.045	0.025	0.012
Ammonical Nitrogen [b]	750.8	352.36	283.76	178
Carbohydrates [c]	22.80	11.56	8.12	6.20

Units: a – µS, **b-**mg/L, **c- %,** PTSW **–** Primary treated spentwash,

Table 3: Amount of N, P, K and S (nutrients) in Spentwash

Chemical Parameters	PTSW	1:1PTSW	1:2 PTSW	1:3 PTSW
Ammonical Nitrogen[a]	750.8	352.36	283.76	160.5
Total Phosphorous[a]	40.5	22.44	17.03	11.2
Total Potassium[a]	7500	4000	2700	1800
Sulphur[a]	70	30.2	17.8	8.6

Unit: a- mg/L, PTSW**:** Primary treated spentwash

Table 4: Growth of Neem and Honge plants different irrigation (cm)

	RW	1:1PTSW	1:2PTSW	1:3PTSW
Name of the plant	15th,22nd, 29th days	15th, 22nd, 29th days	15th 22nd, 29th. days	15th,22nd, 29th. days
Neem	1.2, 3.3, 6.0.	1.0, 1.8, 4.0.	1.4, 3.1, 5.9.	1.9, 3.9, 8.2.
Honge	1.1, 2.3, 5.6.	1.0, 1.9, 3.5.	1.1, 2.2, 5.1.	1.8, 3.0, 7.1.

CONCLUSION

Germination and growth of Neem and Honge were good (100%) in 1:3 SW irrigation, while very poor in 1:1SW (25%), moderate in 1:2 SW (80%) and 90% in RW irrigations. In 1:1 dilution, the germination was very poor (25%). This could be due to the high concentration of spentwash makes mask on upper layer of soil, through which the seeds may not sprout within the stipulated time and spoil. But in 1:3 dilution 100% germination was observed, this could be due to the sufficient quantity of moisture and plant nutrients available to seeds.

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