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Impact of Retted Water (Tank) Treatments on Seed Germination And Vigour Index In *Sesamum indicum* L. Var. Kylm-1 And *Vigna unguiculata* (L.) Walp. Var. Jyothika

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ABSTRACT

The study was aimed to determine the effects of retted water (Tank) on seed germination and seedling growth of *Sesamum indicum* L.Var.Kylm-1 *and Vigna unguiculata* (L.) Walp. Var. Jyothika plants under laboratory conditions. The effect of retted water were compared to that of zero control (distilled water) and at different concentrations such as 5, 10, 15, 20, 25, 30, 35 ,40 ,45, 50,55,60 and 100% (control) used for seed germination and vigour index of seedlings was studied. It has been concluded that retted water has significantly affected the germination and growth of seeds and seedlings of *Sesamum indicum and Vigna unguiculata* and that lower concentration was effective for germination and was re-usable for agriculture.

Keywords : Retted water, *S. indicum* (gingelly), *V. unguiculata* (cowpea), Seed Germination, Vigour Index

I. INTRODUCTION

Retting of coconut husk is the basic process involved in the production of coir and coir-products which is one of the popular traditional occupation of the coastal area of Kerala. The term 'retting' is a technical form of the word rotting and designates the process of decomposition of the tissues surrounding the vegetable fibre [12].As a result of retting large quantities of organic substances including pectin, pectosan, fat, tannin and also toxic polyphenol are liberated into the ambient water by the activity of bacteria and fungi. The oxidation of phenols produces diffusible melanin like pigment, which also release into the medium during husk fermentation. Markedly offensive ordour resembling that of hydrogen sulphide is produced from retting zones during the decomposition of pectin [2].A rise in turbidity, gas formation, foul smell, depletion of oxygen are few of the many noticeable features associated with retting.

In Kerala, most of the traditional industrial-based coir production depends on the backwaters and paddy fields, for the retting process .It may lead to higher rate of pollution in these areas, besides being great threats towards the flora and fauna.

Lots of efforts have been made by different agencies to determine the effect of different effluent discharged from various sources on seed germination of various crops [6; 15; 17]. No comprehensive study on the effect of retted water on seed germination of *S. indicum and V. unguiculata* has been made in details. Therefore, an attempt has been made to analyse the physio-chemical properties of retted water and their effect on seed germination and seedling vigour by using *Sesamum indicum and Vigna unguiculata* at different concentrations.

II. MATERIALS AND METHODS

1.1. Water Sampling

Retted water was collected from closed retted water system (Tank) from Mahadevikadu, Karthikapally Alappuzha district in Kerala. The coconut husk retted water sample were stored separately in pre-cleaned, 5Ltr carboys and stored in refrigerator below 5^0 C. The effect of this water was observed on *Sesamum indicum and Vigna unguiculata*. Standard procedure [1] was followed during the collection and analysis of retted water sample.

1.2. Physical and Chemical properties of retted water

Retted water was analysed for different physico-chemical parameters such as pH, total alkalinity, acidity, conductivity, salinity, biochemical oxygen demand (BOD) and total dissolved solids (TDS) according to APHA (1998) by following the standard methods (Table-2).

1.3. Effect of Retted Water on Seed Germination

The seeds of *S. indicum* L.Var.Kylm-1 and *V. unguiculata* (L.) Walp. Var. Jyothika; were subjected to surface sterilization. The experiments were conducted using glass petri-dishes (Borosil) of 9.0 inch diameter, lined with Whatman'S No.2 filter-paper. Different concentrations of retted water such as 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60% and 100% were prepared by using double distilled water. The experiments were conducted with zero control and control. Each treatment with five replicates and 20 numbers of healthy seeds of uniform size were used. The replicates were irrigated with 2.5ml and 5ml of different dilutions at an interval of 24 hrs. respectively. The plates were kept in the plant growth chamber (Labline, Model No-9001:2008) and adjusted to a temperature of 23^0C and with 95% relative humidity. To avoid fungal contamination, the filter paper was changed every 48 hrs. without disturbing the germinating seeds [11].

The final observations were made after 96 hrs. and 144 hrs. in *S. indicum* L.Var.Kylm-1 and *V. unguiculata* (L.) Walp.Var.Jyothika respectively. Germination was observed daily. Visible radicle growth at 1cm was considered as germinated and the seeds were removed on every assessment to avoid double counting [8]. At the end of experiment, cumulative germination percentage (G %) were calculated for each treatment. Vigour parameters like germination value (GV), Seedling length (Shoot/ Root – S/R), Seedling vigour (Vigour index length basis –VI-L & Vigour index dry weight basis-VI-Dry), Moisture content (MC) and dry matter percentage (DMP) were also computed from the data [4].

The experiments were laid out in a Completely Randomized Design (CRD) and the data were subjected to analysis of variance and the means compared using Duncan's multiple range test (DMRT).

Table-1. Seed germination treatments attempted in *Sesamum indicum* L. Var. Kylm-1 and *Vigna unguiculata* (L.) Walp. Var. Jyothika (Retted water-Tank)

Index No.	Treatments (Irrigated)	Dilution (%)
RWT-S0*	Zero control (Distilled. H_2O)	100
RWT-S1	Control (Concentrated).	100
RWT-S2	RW**	5
RWT-S3	''	10
RWT-S4	''	15
RWT-S5	''	20
RWT-S6	''	25
RWT-S7	''	30
RWT-S8	''	35
RWT-S9	''	40
RWT-S10	''	45
RWT-S11	''	50
RWT-S12	''	55
RWT-S13	''	60
RWT-S14	''	65
RWT-S15	''	70
RWT-V16***	Zero control (Distilled. H_2O)	100
RWT-V17	Control (Concentrated.)	100
RWT-V18	RW**	5
RWT-V19	''	10
RWT-V20	''	15
RWT-V21	''	20
RWT-V22	''	25

RWT-V23	’’	30
RWT-V24	’’	35
RWT-V25	’’	40
RWT-V26	’’	45
RWT-V27	’’	50

- RWT-S* - Retted water tank-*Sesamum indicum* L.Var.Kylm-1
- RW** - Retted water
- RWT-V*** - Retted water tank- *Vigna unguiculata* (L.) Walp.Var.Jyothika

III. RESULTS AND DISCUSSION

The seed samples were taken for germination did not show any natural seed dormancy / or embryo dormancy, as it showed 90-95% of germination rate in both *Sesamum indicum* L.Var.Kylm-1 and *Vigna unguiculata* (L.)Walp.Var.Jyothika).The seeds were irrigated at equal interval of 24 hrs. the optimum time required for germination was noted as 48 hrs. and 24 hrs. respectively.

The seeds of *Sesamum indicum* L.Var.Kylm-1 and *Vigna unguiculata* (L.)Walp Var. Jyothika were irrigated by using retted water (Tank), at 25%, 5% & 10% dilutions showed an increase in germination percentage. The treatment of seeds might have increased the permeability of the seed-coat resulting in the hydro-imbibition of water. The effluent treatment at lowest dilution promote quick germination and vigorous seedling growth in *Vigna unguiculata* and *Psium sativum* [10; 14]. According to them, effluent treatment may be affected to the growth of the plant species due to the degradation of water quality.

The retted water treatment on seed germination percentage were recorded as 82%, 79%, 70% in *S. indicum* and 61%, 73%, 63% *V. unguiculata* (Table-2).The marginal difference between germination percentages were observed remarkably due to the intake of retted water sample contain anion and acidic nature which can be beneficial for seed germination and seedling growth [2; 3; 16].

Certain physical, chemical, biological properties of water up to an adequate level are good for health but becomes toxic at excessive level [13]. The optimum dilution and duration of irrigation for each plant species by using retted water promote germination and seedling growth in *S. indicum* L. Var. Kylm-1 and *V. unguiculata* (L.) Walp. Var. Jyothika.

The results were analysed in this experimental series and the table adduced for indicative variation factors of seedling growth (Table-3). In support of the findings [5; 7], the variations are due to the prevailing environment of the sample or experimental duration, in seed vigour and emergence of seedling.

Table 2: Physiochemical characteristics of Retted water-Tank

Sl.no.	Parameters	Observation/ Inference
1.	Colour	Dark reddish brown
2.	Odour	Unpleasant
3.	PH	5.59
4.	Alkalinity	3.59
5.	Acidity	14.4
6.	Conductivity	9.6
7.	Salinity	4.91
8.	BOD	7.66
9.	TDS	8.07

The effect of retted water treatments during seedling growth increased the moisture content as well as high dry matter production. It may be due to the effect of irrigating the seeds with retted water (Tank) which enable the activation of growth regulating hormones such as GA_3 and its activity [9]. It is noteworthy that, retted water irrigation with an appropriate dilution show stimulatory effect on shoot/root-ratio and root/shoot-ratio, and percentage of moisture content during the phase of growth of seedlings (Table-3). It may be due to increased tissue hydration and maintenance of moisture level required for seed germination [10].

The pH level, TDS, BOD, Conductivity and Salinity of retted water (Table-2) with proper dilutions (tank) such as 50%, 40% and 30% in *S. indicum* L.Var.Kylm-1 and *V. unguiculata* (L.) Walp. Var. Jyothika helped to increase the dry matter content and thereby the vigour index also increased significantly. It may be attributed to the high rate of cell division and cell enlargement, releasing of more potentially endogenous growth regulators, induction of plasticity of cell walls and the effect on cell wall extensibility and / or its role in mobilizing the reserves during germination and it may increase the vigour and development [16].

Table 3. Effect of Retted water treatments on seed germination in *Sesamum indicum* L.Var.Kylm-1 and *Vigna unguiculata* (L.) Walp. Var. Jyothika (Tank) on G%, GV, S/R, R/S-ratio, VI-L, VI-Dry weight basis, MC and DMP

Treatment index no.	G%	GV	S/R RATIO	R/S RATIO	VI-L	VI-Dry	MC	DMP
RWTS0	92 a	1.19 defgh	0.56 e	1.80 a	163.8 ab	4.6 ab	93.75 bcd	6.25 fgh
≠								
RWTS2	79 e	1.67 abcd	0.64 de	1.56 abc	175.2 a	3.95 abc	94.51 bc	5.49 gh
RWTS3	70 g	2.06 a	0.66 de	1.52 abcd	169.9 ab	4.20 abc	93.41 bcde	6.59 efgh
RWTS4	80 de	1.39 bcdef	0.64 de	1.55 abc	161.1 bc	4.80 a	89.66 ij	10.34 ab
RWTS5	81 cd	1.33 cdefg	0.63 de	1.60 abc	148.8 cd	4.05 abc	91.94 defg	8.06 cdef
RWTS6	82 c	1.17 defgh	0.60 de	1.67 ab	96.64 g	2.46 cd	95.16 b	4.84 h
RWTS7	68 h	1.88 ab	0.92 ab	1.09 efg	140.0 d	3.40 abc	90.91 fghi	9.09 bcd
RWTS8	69 gh	1.67 abcd	0.68 cde	1.48 abcde	115.8 ef	2.76 bc	92.86 cdef	7.14 defg
RWTS9	66 i	1.22 defgh	0.80 abcd	1.25 cdefg	96.46 g	3.30 abc	91.67 efgh	8.33 cde
RWTS10	75 f	1.83 abc	0.71 bcde	1.41 abcdef	122.6 e	3.75 abc	90.57 ghij	9.43 abc
RWTS11	68 h	0.88 gh	0.82 abcd	1.22 cdefg	95.76 g	4.08 abc	88.68 j	11.32 a
RWTS12	66 i	1.50 bcde	0.89 abc	1.12 defg	101.8 g	2.64 bc	92.73 cdef	7.27 defg
RWTS13	58 l	1.02 efgh	1.01 a	0.99 g	92.40 g	0.58 de	97.73 a	2.27 i
RWTS14	47 n	0.94 fgh	0.99 a	1.01 fg	104.4 fg	0.47 de	97.96 a	2.04 i
RWTS15	40 o	0.80 h	0.79 abcd	1.27 bcdefg	78.32 h	0.40 e	97.92 a	2.08 i
RWTV16	90 b	1.17 a	1.55 bc	0.65 bc	214 a	156.6 a	87.6 d	12.4 a
≠								
RWTV18	73 f	0.57 e	1.35 d	0.74 a	176.1 b	83.22 c	90.48 ab	9.52 cd
RWTV19	63 j	0.90 bc	1.50 c	0.67 b	188.6 b	59.22 g	90.86 a	9.14 d
RWTV20	59 l	1.05 ab	1.27 d	0.78 a	185 b	61.36 f	90.92 a	9.08 d
RWTV21	56 m	0.71 cde	1.55 bc	0.64 bcd	168.3 b	68.32 e	89.93 abc	10.07 bcd
RWTV22	61 k	0.80 cd	1.73 a	0.58 de	127.4 c	92.72 b	88.07 cd	11.93 ab
RWTV23	55 m	0.33 f	1.66 ab	0.60 cde	103.2 d	82.50 c	87.94 cd	12.06 ab
RWTV24	58 l	0.70 cde	1.65 ab	0.61 bcde	108.9 cd	77.72 d	88.14cd	11.86 ab
RWTV25	48 n	0.50 ef	1.76 a	0.57 e	115.2 cd	60.48 fg	88.71 cd	11.29 abc
RWTV26	35 p	0.63 de	1.68 a	0.60 cde	118.2 cd	42.00 h	89.74 abc	10.26bcd
RWTV27	28 q	0.54 ef	1.28 d	0.68 a	115.2 cd	29.40 i	90.64 ab	9.36 cd

*4 and 6 days old seedlings.

≠ Index No.RWTS1 and RWTV17 not included because no results were obtained by these treatments.

€ In a column, means with same letter do not differ significantly by DMRT at p‹5% level.

IV. CONCLUSION

From the present study it was concluded that most of the seed germination characteristics were adversely affected at lower dilution of retted water. On the basis of overall performance by two crops (*Sesamum indicum* L. Var. Kylm-1 and *Vigna unguiculata* (L.) Walp. Var. Jyothika) were subjected to retted water treatments, it is suggested that, the higher dilution can be used for irrigation purposes in agricultural practices. The treatment of retted water is necessary to minimize the pollution effects before it is discharged into the open land /water bodies.

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