© 2017 IJSRSET | Volume 3 | Issue 8 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
Themed Section: Engineering and Technology

# Impact of Different Dilutions of Retted Water (Open-field) on Seed Germination and Vigour Index in *Sesamum indicum* L.Var.Kylm-1 and *Vigna unguiculata* (L.) Walp. Var. Jyothika

**C. Priya*, N. Hari**
Department of Botany, C.M.S. College, Kottayam, Kerala, India

## ABSTRACT

The study was aimed to determine the effects of retted water 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 in seed germination and vigour index of seedlings was compared to that of zero control (distilled water) and also to different concentrations such as 5, 10, 15, 20, 25, 30, 35 ,40 ,45, 50,55,60 and 100% (control) . It has been concluded that retted water has significantly affected the germination and growth of seeds and seedlings of *Sesamum indicum and Vigna unguiculata* was lower and that concentration were effective for germination and was re-usable for agriculture.

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

## I. INTRODUCTION

Water scarcity is having negative effect on agricultural inputs. Over pumping, increased population and rapid urbanization are some of the reasons taking place in most developing countries. This will increase the demand for water and its availability for agriculture purposes. The availability of natural water is at risk and the depletion of water bodies caused due to salinization, pollution, soil-erosion and flooding.

Retting is natural biochemical operation practiced for extraction of vegetable fibres like coir, flax jute and hemp. 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)]. The activity of bacteria and fungi during retting, liberate large quantities of organic substances like pectin, pectosan, fat, tannin and also toxic polyphenol into the ambient water. The oxidation of phenols produces diffusible melanin like pigment, which is also released into the medium during coir fermentation. Markedly offensive ordour resembling those of hydrogen sulphide is produced from retting zones during the decomposition of pectin [(2)]. The noticeable features associated with retting are rise in turbidity, gas formation, foul smell, depletion of oxygen. The extraction of coir-fibre carried out traditionally by open retting involves the immersion of coconut husks in waterbody for a period of 6-12months. In Kerala, most of the traditional industrial-based coir production depends on the backwater and paddy-fields, due to their need for retting .It may lead to higher rate of pollution in these areas and naturally it may lead to great threats towards the flora and fauna.

The use of sewage water for irrigation purpose is increasing mostly in cities and dry area where there is scarcity of water [(7)].

Efforts have been made by different agencies to determine the effect of different effluents discharged from various sources on seed germination of various crops [6,15,17] , no comprehensive study of effect of retted water on seed germination of *S. indicum and V. unguiculata* has made been 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* of different dilution.

## II. MATERIALS AND METHODS

### 1.1. Water sampling

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

### 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 the standard methods [1] (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 $23^0$C and with 95% relative humidity. To avoid fungal contamination, the filter paper was changed every 48hrs without disturbing the germinating seeds [11].

The final observations were made after 96hrs and 144hrs 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 datas 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-Open-field).

| Index No. | Treatments (Irrigated) | Dilution (%) |
|---|---|---|
| RWP-S0* | Zero control (Distilled. $H_2O$) | 100 |
| RWP-S1 | Control (Concentrated). | 100 |
| RWP-S2 | | 5 |
| RWP-S3 | '' | 10 |
| RWP-S4 | '' | 15 |
| RWP-S5 | '' | 20 |
| RWP-S6 | '' | 25 |
| RWP-S7 | '' | 30 |

| | | |
|---|---|---|
| RWP-S8 | ’’ | 35 |
| RWP-S9 | ’’ | 40 |
| RWP-S10 | ’’ | 45 |
| RWP-S11 | ’’ | 50 |
| RWP-S12 | ’’ | 55 |
| RWP-S13 | ’’ | 60 |
| RWP-S14 | ’’ | 65 |
| RWP-S15 | ’’ | 70 |
| RWP-V16*** | Zero control (Distilled. $H_2O$) | 100 |
| RWP-V17 | Control (Concentrated.) | 100 |
| RWP-V18 | | 5 |
| RWP-V19 | ’’ | 10 |
| RWP-V20 | ’’ | 15 |
| RWP-V21 | ’’ | 20 |
| RWP-V22 | ’’ | 25 |
| RWP-V23 | ’’ | 30 |
| RWP-V24 | ’’ | 35 |
| RWP-V25 | ’’ | 40 |
| RWP-V26 | ’’ | 45 |
| RWP-V27 | ’’ | 50 |

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

## III. RESULTS AND DISCUSSION

The seed samples taken for germination did not show any natural seed 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 unguicula* (L.)Walp Var. Jyothika irrigated by using retted water (open-field), at 5%, 25% & 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.At lower dilution, effluent treatment enhance fast 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 percentages were recorded as 70%, 83%, 85% *S.indicum* and 43%, 50%, 35 % *V. unguiculata* (Table-2).The germination percentages showed marginal difference 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] .

**Table 2.** Physiochemical characteristics of Retted water-Open field

| 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 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 physio-chemical and biological properties of water upto an adequate level are good for health but becomes toxic at excessive level [13].

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

Increased moisture content and high dry matter production during seedling growth are due to the effect of irrigating the seeds with retted water (Open-field) which enable the activation of growth regulating hormones such as $GA_3$ and its activity [9]. Retted water irrigation with proper 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) 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 (Open-field) 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 [17].

**Table 3.** Effect of Retted water treatments on seed germination in *Sesamum indicum* L.Var.Kylm-1 and *Vigna unguiculata* (L.) Walp.Var.Jyothik (Open-field) 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 | 76 d | 1.33 ab | 0.38 g | 2.67 a | 130.2 cd | 4.56 abc | 93.10 abc | 6.9 cde |
| ≠ | | | | | | | | |
| RWTS2 | 70 ef | 0.50 c | 0.75 abc | 1.34 de | 142.6 cd | 6.30 a | 90.91 d | 9.09 b |
| RWTS3 | 83 a | 1.69 a | 0.52 efg | 1.93 bc | 168.8 ab | 5.81 ab | 91.57 cd | 8.43 bc |
| RWTS4 | 70 e | 1.41 ab | 0.73 abcd | 1.38 de | 191.1 a | 3.50 cd | 94.12 a | 5.88 de |
| RWTS5 | 68 g | 1.41 ab | 0.44 fg | 2.29 ab | 148.2 bc | 4.08 bcd | 94.0 ab | 6 .0 de |
| RWTS6 | 85 a | 1.09 b | 0.84 a | 1.19 e | 123.0 d | 4.25 bcd | 94.38 a | 5.62 e |
| RWTS7 | 71 e | 1.17 ab | 0.80 ab | 1.25 e | 153.6 bc | 4.97 abc | 90.91 d | 9.09 b |
| RWTS8 | 69 fg | 1.22 ab | 0.63 cde | 1.58 cde | 142.2 cd | 4.14 bcd | 92.0 bcd | 8.00 bc |
| +RWTS9 | 65 h | 0.95 bc | 0.59 def | 1.68 cd | 129.7 cd | 5.20 abc | 87.88 e | 12.12 a |
| RWTS10 | 66 h | 1.08 b | 0.66 bcde | 1.52 cde | 145.1bcd | 3.30 cd | 90.91 d | 9.09 b |
| RWTS11 | 44 j | 0.94 bc | 0.81 ab | 1.24 e | 123.0 d | 2.20 d | 92.42 abcd | 7.58 bcd |
| ≠ | | | | | | | | |
| RWTV16 | 83 b | 0.85 abc | 1.77 cde | 0.57 def | 125.1 c | 104.58 a | 90.88 a | 9.12 ab |
| ≠ | | | | | | | | |
| RWTV18 | 43 j | 0.75 abc | 2.56 ab | 0.39 fg | 125.1 c | 64.07 b | 90.98 a | 9.02 ab |
| RWTV19 | 50 i | 1.00 a | 1.15 fg | 0.87 ab | 230.8 a | 58.0 c | 91.21 a | 8.79 cd |
| RWTV20 | 33m | 0.67 bcd | 2.75 a | 0.36 g | 161.9 b | 41.25 f | 91.6 a | 8.4 cd |
| RWTV21 | 40 kl | 0.88 ab | 2.16 bc | 0.46 efg | 163.8 b | 44.8 de | 90.94 a | 9.06 ab |
| RWTV22 | 33 m | 0.13 f | 1.53 defg | 0.65 cde | 46.80 g | 30.36 g | 90.88 a | 9.12 b |
| RWTV23 | 34 mn | 0.47 de | 1.60 def | 0.62 de | 60.00fg | 41.82 f | 90.31 a | 9.69 a |
| RWTV24 | 41 k | 0.47 de | 1.97 cd | 0.51 defg | 114.0 cd | 44.28 e | 91.27 a | 8.73 c |
| RWTV25 | 40 kl | 0.23 ef | 1.48 efg | 0.68 bcd | 77.98 ef | 32 g | 92.02 a | 7.98 de |
| RWTV26 | 40 kl | 0.60 cd | 1.10 g | 0.91 a | 90.36 de | 46.8 d | 90.31 a | 9.69 a |
| RWTV27 | 39 n | 0.33 ef | 1.22 fg | 0.82 ab | 99 cde | 31.2 g | 91.36 a | 8.64 c |

* 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

The use of retted water in plant nourishment would be beneficial alternative resources to fresh water. On the overall performance as exhibited by two crops (*Sesamum indicum* L. Var. Kylm-1 and *Vigna unguiculata* (L.) Walp. Var. Jyothika) when subjected to retted water, it can be suggested that, retted water can be used for irrigation purposes in agricultural practices after proper dilutions. Treatment of retted water is necessary to minimize the pollution effect before it is discharged to the land.

## V. ACKNOWLEDGMENT

The authors thank to CMS College Kottayam, Kerala for providing required facilities to carry out this research work.

## VI. REFERENCES

[1]. APHA, (1998).Standard methods for examination of water and waste water, American Public Health Association, Washington DC, USA.

[2]. Aziz, A. (1978).Ecology of retting grounds in the backwater system of Kerala, Ph.D. Thesis University of Kerala.

[3]. Chopra,A.K., Srivastava,S.& Kumar, V. (2011).Comparative study on agro-potentiality of paper mill effluent and synthetic nutrient (DAP) on Vigna unguiculata L. Walp. (Cowpea). J. Chem. Pharm. Res. 3(5):151-165.

[4]. Czabator F.B.J. (1962). Germination value; an index combining speed of completeness of pine seed germination, forest science, 8,386-396.

[5]. Dash, A.K. (2012).Impact of domestic waste water on seed germination and physiological parameters of rice and wheat. IJRRAS. 12(2):280-286.

[6]. Doke, K. M., Ejazuddin. M., Rapolu, J., & Shaikh, A. (2011). Physio- chemical analysis of sugar industry effluent ant its effect on seed germination of vigna angularis, vigna cylindrical and sorghum cernum. Annals of Evs. Sc.5:7-11.

[7]. Girisha, S. T & Raju, S. N. (2008).Effect of sewage water on seed germination and vigour index of different varieties of groundnut (Arachis Hypogaea L.).J. Env. Bio. 29(6):937-939.

[8]. ISTA (1985).International rules for seed testing annexes. Seed Science and Technology. 13(2):386-513.

[9]. Lavee, S. & Galston, A. W. (1968). Hormonal control of peroxidase activity in cultured pelargonium pith. Amer.J.Bot.55:890-893.

[10]. Lenin, M., Kumar, S. M. & Mycin, R.T. (2014).Effect of sago factory effluent on seed germination and seedling growth of gingelly (Sesamum indicum L.) varieties. Int. J. Life Sc. Bt. & Pharm.Res.3 (1): 2250-3137.

[11]. Mayer A.M. & Mayber, P. A. (1963). The germination of seeds, London: Pergamon Press.

[12]. Nathawal, W.R. (1967). Coconut husk an industrial raw material for coir.10 (3):11-6.

[13]. Nawaz, S., Ali, S. M., & Yasmin, A. (2006). Effect of industrial effluents on seed germination and early growth of Cicer arientum. J. Biol. Sci. 6(1):49-54.

[14]. Panaskar, D. B & Pawar, R. S. (2011). Effect of textile mill effluent on growth of Vigna unguiculata and Psium sativum seedlings. Indian J. Sci. & Tech. 4(3):266-272.

[15]. Rajesh, M., Jayakumar, K., Satheesh Kannan, T.M.and Sankar Ganesh, K. (2013). Influence of sugar mill effluent on seed germination and seedling growth of Cluster Bean (Cyamopsis tetragonaloba). Int. J. Environ. And Bioenergy, 7(2): 54-62.

[16]. Shibu Vardhanan, Y., Ajit, H. & Manilal, V. B. (2013).Closed retting: A green technology for controlling coir retting pollution of backwaters. J. Env. Res. & Develop. 7(4):1523-1530.

[17]. Sinha, S.N & Paul, D. (2013).Impact of sewage water on seed germination and vigour index of Cicer arietinum L. and Psium sativum L. Inter. J. Food, Agri. & Sci. 3(3):19-26.