# Effect of polluted Water Bodies on fertility of soil and its testing by ACF-MF and ACF-MW

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**Abstract**

Agriculture is largest sector of national economy. India is an agriculture country. Soil is one of the major factors affecting on crop cultivation .Soil organism play key role in nutrient transformation, organic forms are transformed in to their respective inorganic forms and plants are able to absorb them for their growth and development. It was observed that soil present near the polluted water bodies has less fertility as compared to other. Plants grown in the polluted water ,it will directly affect on the life forms .Discharge of polluted waste water in soil ,reduces the number of microbes which are essential for maintaining soil fertility .Therefore ,tried to develop a eco-friendly and approach to treat such polluted water by surface modified ACF-MW is prepared from bio-waste and it is environment friendly.

**Key words:** Soil quality, Polluted water-bodies, Microorganisms, MFT, MW-ACF.

## Introduction

Soil is one of the most important natural resources for crop production. It is estimated that the rate of soil formation is about 2.5 cm every 150 years (Friend, 1992); i.e. soil is non-renewable within the human-life-span. It is in the interests of the farmer, and the population as a whole, to ensure that good soil management is practised so that this resource is preserved for continued use by the current and future generations. (Catriona *et.al*, 1999) The soil serves the needs of the plant by providing Water, Air, Nutrients, Stability. The ability of a soil to provide these services may be evaluated by key soil attributes (see table following). (Landcare, 2004) Biological $N_2$ fixation represents the major source of N input in agricultural soils including those in arid regions. The major $N_2$-fixing systems are the symbiotic systems, which can play a significant role in improving the fertility and productivity of low-N soils. The Rhizobium-legume symbioses have received most attention and have been examined extensively (Hamdi *et. al.*, 1999). Oxygen is required to make use of the carbohydrate energy source and this is mainly taken from the soil atmosphere. Poor aeration will result in reduced growth, poor aeration can cause development of toxic substances which may interfere with root growth. (Catriona *et. a.*, 1999)

| Key soil attribute | Relevance to plants |
|---|---|
| Wetness | Water supply, exclusion of air and, c onsequently, exclusion of oxygen |
| Root barrier anchor | Controls the depth of soil available for roots to extract water and nutrients, |
| Stoniness | Stones and rocks dilute the volume of soil within the root depth that is available for water storage and nutrients |
| Porosity | Controls nutrient supply and reserves |
| Drought proneness | An interaction between climate and soil attributes |

Saturation by water reduces the supply of air through pores in the soil. After a period of time microbes that use oxygen exhaust the available supply and the soil becomes 'anaerobic'. This affects the roots of many plants and initiates a number of chemical changes in the soil. One chemical change is experienced by iron that occurs naturally in mineral soil. Iron is an element responsible for the brown to red colours of soil and remains as an insoluble colouring agent in the presence of oxygen. Anaerobic conditions cause some of the iron to become soluble and to migrate. It moves towards areas of relatively

high oxygen content where it concentrates into rust coloured patches or spots (mottles). The areas depleted of iron have lost their colouring agent and become grey **(** Landcare, 2004**).**

**Material and methods:**

The samples were collected from different sites to identify soil micro flora present in different locations Sample use: soil sample near contaminated water area. After collecting soil from different places soil were processed in the laboratory to check the fertility of soil with the presence of fertile organisms

**Sample Preparation:**

i) ASTM standard activated carbon was purchased from local market of Nagpur from Merck Suppliers and its iodine number was determined.

ii) Preparation of Microwave Activated Carbon for microbial treatment:

Activated carbon was prepared from biological waste material by muffle furnace and modern microwave technique. The raw material was processed before activation for moisture removal.

iii) Surface modification of Activated Carbon for Microbial Treatment:

The raw material was impregnated with activating agent. Further this treated raw material was subjected to activation to obtain activated carbon with modified surface.

The surface modified activated carbon gave higher iodine number which indicates high adsorptive capacity.

**1) Collection and Processing:**

| Sample no. | Name of place |
|---|---|
| 1) soil sample | near Ambazari lake |
| 2) soil sample | near Futara lake |
| 3) soil sample | near Nagnala |
| 4) Soil sample | near well |
| 5) soil from | fertile place |

Different soil media were used selective for fertile bacteria and fungi were as follows-

**1) Nutrient agar media** - Nutrient agar media gives total viable count of microbes present in soil .media giving count above 300 not taken as viable count, as it show symbiotic or antagonistic relationship in soil.

**2) Actinomycete isolation agar media** –Soil Actinomycete are estimated by pour plate method using Starch Casein Agar Medium.

**3) Cooke rose Bengal agar media** - Cooke rose Bengal media is a selective medium formulated as per Cooke ,it contain variety of inhibitory agents have been used to inhibit bacteria to isolate fungi from mixed flora.

**4) Yeast mannitol agar** - Beijerinck was first to used the media .Yeast Mannitol Agar used for cultivation of symbiotic nitrogen fixing organism i.e. Rhizobium spp

**5) Jenson's media** - Jenson's media is formulated according to jenson and is recommended for detection and cultivation of nitrogen fixing bacteriai..e Azotobacter.

**Methodology:**

Soil from different places was processed by Pour plate technique to check different fertile bacteria and fungi.

1)10 gm soil from each specific location were weigh and dissolve in 90ml of autoclaved water

2) Diluted soil were kept for 1hr of shaking on shaker at 100 rpm

3) After shaking sample processed by pour plate method making dilutions up to $10^{-6}$ as follows.

**Protocol**

**Results And Discussion :**

After biological analysis of soil sample at laboratory scale following results were observed, Different media used for isolation of fertile bacteria shows above results-

1) Nutrient agar :NA shows total viable count of microbes on media

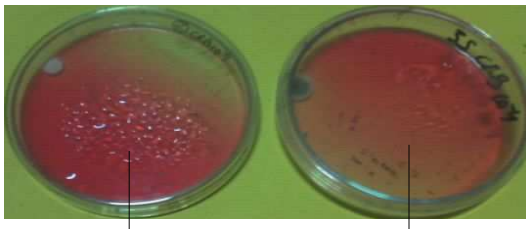
Polluted water near soil soil from good location

Above figure clearly shows that experimental soil contain very low fertile soil microorganism actinomycete than standard soil.

2) Actinomycete isolation agar media-Actinomycete can be isolated from actinomycete isolation agar

Polluted water near soil (EXP) soil from good location (STD)

3)Cooke rose Bengal agar media ;Cooke rose Bengal media is a selective medium have been used to inhibit bacteria to isolate fungi from mixed flora.



Polluted water near soil (EXP) soil from good location (STD)

Polluted water near soil (EXP) soil from good location (STD)

On above media both experimental and standard soil samples show presence of fungi in soil sample.

4) Jenson's media: Jenson's media is formulated according to jenson and is recommended for detection and cultivation of nitrogen fixing bacteria.

Polluted water near soil (EXP) Soil from good location(STD)

Polluted water near soil (EXP) Soil from good location(STD)

In Jenson's media colonies on experimental soil are more prominent than standard soil

5)yeast mannitol agar :Beijerinck was first to used the media .Yeast Mannitol Agar used for cultivation of symbiotic nitrogen fixing organism..e Rhizobium spp

**Discussions:**

| | Soil Media used showing CFU/gm Experimental soil | | | | |
|---|---|---|---|---|---|
| Sample no | ACTINO media | NA media | JENSon's media | YEMA medi | CRB media |
| 1-AMB | **NG** | 10 | NG | NG | NG |
| 2-FUT | **1** | 39 | 2 | NG | NG |
| 3-NAG | **12** | 29 | 16 | 5 | NG |
| 4-WELL | **NG** | 34 | 1 | 9 | NG |
| | | 2nd Day | | | |
| 1-AMB | **NG** | 22 | NG | 2 | NG |
| 2-FUT | **3** | TNTC | 2 | 4 | 1 |
| 3-NAG | **22** | 36 | 18 | 15 | NG |
| 4-WELL | **NG** | NG | 1 | 10 | NG |

Table no. 1 showing colonies on different media Experimental soil:

**Standard soil:**

| Sample no | ACTINO media | NA media | JENSon's media | YEMA medi | CRB media |
|---|---|---|---|---|---|
| 1S | **3** | 46 | NG | 3 | NG |
| 2S | **30** | 39 | 4 | 1 | 1 |
| 3S | **5** | NG | 4 | 3 | NG |
| 4S | **4** | 12 | NG | 4 | 1 |
| | | 2nd Day | | | |
| 1S | **25** | TNTC | 2 | 11 | NG |
| 2S | **50** | 70 | 10 | 5 | 2 |
| 3S | **7** | 2 | 8 | 8 | NG |
| 4S | **20** | 19 | 4 | 4 | 1 |
| | Soil Media used showing colonies per gm | | | | |
| Sample no; | ACTINO media | NA media | JENSon's media | YEMA media | CRB media |
| 1-AMB | **2** | 9 | 2 | 7 | NG |
| 2-FUT | **12** | 30 | NG | 4 | 1 |
| 3-NAG | **22** | 21 | 4 | 6 | NG |
| 4-WELL | **NG** | 29 | 1 | 7 | 1 |

**Results after treatment with ACF-MW**

| Sample no | ACTINO media | NA media | JENSon's media | YEMA media | CRB media |
|---|---|---|---|---|---|
| 1S | **1** | 19 | NG | 4 | NG |
| 2S | **9** | 39 | 4 | 5 | NG |
| 3S | **11** | NG | 4 | 8 | NG |
| 4S | **NG** | 12 | NG | 3 | NG |

**Standard Treatment:**

Above results shows that experimental soil near polluted water bodies contain fertile organism but in less proportion and some useful microorganism like Actinomycete are totally absent in some cases:

1) In experimental soil nutrient agar medium shows maximum colonies than standard soil which interfere with normal microbial soil flora

2) Actinomycete medium shows no growth in experimental soil whereas standard soil shows countable colonies

3) Jensons media shows countable colonies in experimental soil than standard soil

4 )Cooke rose Bengal media does not show significant difference in colonies

5) Yeast Mannitol Agar shows reduced colonies in Exp soil than Std soil.

**Conclusions:**

Above results showed that polluted water bodies clearly affect fertility of soil .Polluted water contain more microbial load which interfere with normal flora of soil sample and indirectly reduces fertile bacteria from soil sample .It was observed that Activated carbon modified fabric is efficient in reducing microbial contaminants without affecting normal soil microbial flora , so that fertile micro organism can efficiently sustain in soil and soil fertility can be maintained .

- Polluted water contaminants efficiently removes by ACF-MW
- ACF-MW not affect normal soil flora
- It is cost effective and eco friendly approach

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