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The slimy deposition in drinking water and effect of disinfectant use in storage of drinking water in different area Kanpur district

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Abstract
In previous paper we had concluded that the drinking water quality degraded on storage and it did not even of use after 5 days due to very high accumulation of slimy biomass. In this paper we need to develop some filter techniques which were effective to store the drinking water for prolonged period. For that we will use 3 basic disinfectant through aluminum sulpahte, ferrous sulphate and ferric chloride, after the experiment it has concluded that the ferric cholride has the highest effect on the slime mould colony growth suppressing.
Key works: *disinfectant, slimy colony growth, ferric cholride*

I. Introduction

Using cultivation techniques, ascomycetous filamentous fungi were those mainly detected, classified as members of the genera Acremonium, Alternaria, Aspergillus, Cladosporium, Fusarium, Penicillium and Trichoderma. The second most cultivated group were fungi from the subphylum Mucormycotina (former phylum Zygomycota). The presence of yeasts from surface-, ground- and tap water was rarely reported, probably due to the cultivation bias [19]. Numbers and diversity of fungi were reported to be higher in surface water in comparison to ground- and tap water; environmental factors, such as high contents of organic nutrients, varying temperature, pH, and water flow being the main reason why. During the production of tap water, cleaning processes including techniques for removing large particles from raw water, and addition of chlorine contribute to a lower load of fungi. Yet, some species remain present in tap water, later establishing biofilms that persist in water distribution systems. Reservoirs before elevation stations, positive pressures in building distribution designs, preventive maintenance, permanent running water in the system and adequate residual disinfectant are examples of how the distribution system should be operating.

Presence of fungi in biofilms and their interactions with other microorganisms remain poorly understood, even though in recent years the use of metagenomic approaches brought more detailed insight to this field. Fungi growing in biofilms inside taps and in tap water affect the taste and odour, interfering with the chlorination process, due to the release of a large scale of products known as secondary metabolites. These may be very diverse and specific for different fungal species. While the role of secondary metabolites in the ecology of fungi is to defend their habitat, and suppress the growth of competitors, some of them are toxic to animals, and may present a risk for human health in higher concentrations or under prolonged time of exposure. Not only secondary metabolites, but also fungal cell wall components and the fungal load itself may contribute to the emergence of allergies and other opportunistic and systemic infections, mainly in immunocompromised individuals. Although in the last few decades fungi are becoming frequently recognized as causative agents of respiratory, mucosal, rhinocerebral, cutaneous and subcutaneous infections, they remain largely overlooked in the regulations of water quality and consumption. Possible reasons may be the lack of knowledge of the fungal load in water, divergent cultivation methods, heterogeneous mechanisms of fungal pathogenicity and consequently the low number of reports connecting fungal presence in tap water and the occurrence of diseases in humans. Also, unlike obvious outbreaks, low prevalence afflictions are handled discretely, and rarely explored as to how they originate.

Effect of ph alteration

The pH of water has shown to have an important role on fungal presence, their growth and bioremediation processes. Positive correlation was observed between the growth of aquatic hyphomycetes and pH between 5 and 7, and confirmed recently in a study of deep groundwater reporting the highest diversity in mixed fungal communities at slightly lower pH. Acidic pH has a positive influence on binding of heavy metals like manganese and cadmium to the fungal cell wall components, which can be beneficial for some fungal species. Changes in pH in the environment are related also with the polymorphic growth of certain fungi, with low pH inducing growth of round, swollen hyphal cells or yeast-like cells, as observed for Alternaria, Fusarium and Mucor species. Some species of black yeasts, like Exophiala dermatitidis were reported to form thick cell walled muriform clumps. Changes in growth form lower the pH-induced stress allowing fungi a more efficient

intake of nutrients and the survival under extreme conditions. The pH-induced stress could be additionally lowered with the intake of certain ions, like calcium. A recent study conducted by Novak Babič et al. showed a positive correlation between higher concentrations of calcium and magnesium ions, contributing to the water hardness, and the presence of fungi in water. Not only inorganic ions, also carbon availability, nitrate, phosphate and sulphate positively correlated with the presence and diversity of fungi in water systems; suggesting an important role of fungi in geochemical cycles of metals, carbon, nitrogen and sulphur in water habitats. Additionally, the presence of nitrate and phosphate in water has been shown to be important for fungal growth and the effective breakdown of long-chained components of plant material and other organic matter.

II. Research Methodology

The present paper represents presence of fungi in drinking water from different area of Kanpur district and their evaluation by varying the pH of the water system and see the effect on increasing days of storage. The common ph alteration is by using aluminium sulphate, ferrous sulphate, ferric chloride commonly used in cleaning or treatment of water.

III. Result And Observation

As the previous experiments water sample has been collected from 5 different region of the Kanpur district where common people mostly use the supply water as their source of water use and they stored the water for prolonged use. The experiment was performed in 4 setup in which one is set as control without addition of any disinfectant, while other 3 were with addition of common disinfectant like aluminium sulphate (alum), ferrous sulphate and ferric chloride with standard dose of 600 mg L(-1). And examine the effect for 7 days.

Table: control setup without any disinfectant

Sample	1 day	2 nd day	3 rd day	4 th day	5 th day	6 th day	7 th day
Area 1	0.122	0.125	0.129	0.131	0.137	0.142	0.151
Area 2	0.125	0.127	0.129	0.132	0.139	0.148	0.156
Area 3	0.126	0.129	0.132	0.138	0.142	0.149	0.158
Area 4	0.129	0.134	0.139	0.142	0.148	0.152	0.159
Area 5	0.127	0.135	0.14	0.146	0.148	0.156	0.159

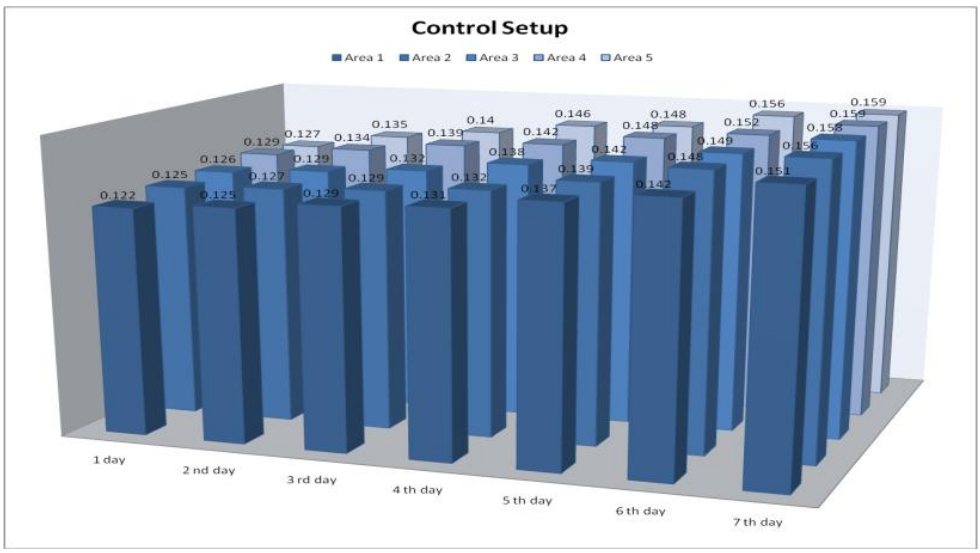

Figure: **control setup without any disinfectant**

Table: Effect of aluminium sulphate on storage duration of water

Sample	1 day	2 nd day	3 rd day	4 th day	5 th day	6 th day	7 th day
Area 1	0.109	0.111	0.119	0.125	0.129	0.134	0.139
Area 2	0.112	0.119	0.121	0.129	0.132	0.141	0.145
Area 3	0.126	0.129	0.132	0.138	0.142	0.149	0.158

Area 4	0.126	0.131	0.136	0.140	0.142	0.148	0.152
Area 5	0.127	0.134	0.139	0.142	0.146	0.149	0.151

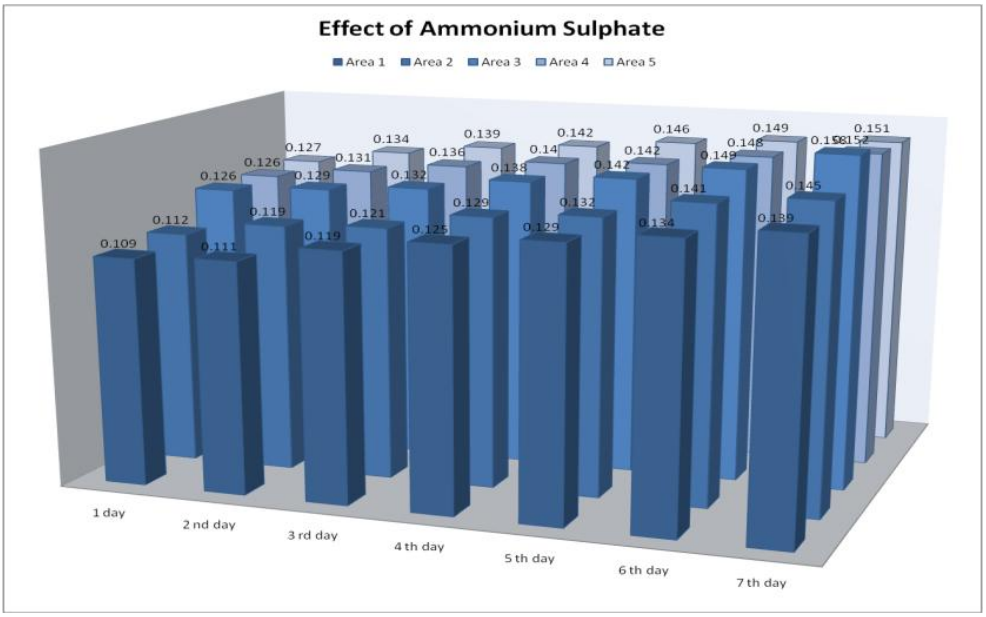

Figure: **Effect of aluminium sulphate on storage duration of water**

Table: Effect of ferrous sulphate (FeSO4) on storage duration of water

Sample	1 day	2 nd day	3 rd day	4 th day	5 th day	6 th day	7 th day
Area 1	0.102	0.105	0.119	0.121	0.127	0.132	0.141
Area 2	0.105	0.107	0.119	0.122	0.129	0.138	0.146
Area 3	0.106	0.109	0.112	0.128	0.132	0.139	0.148
Area 4	0.109	0.104	0.119	0.122	0.138	0.142	0.149
Area 5	0.107	0.105	0.114	0.126	0.138	0.146	0.149

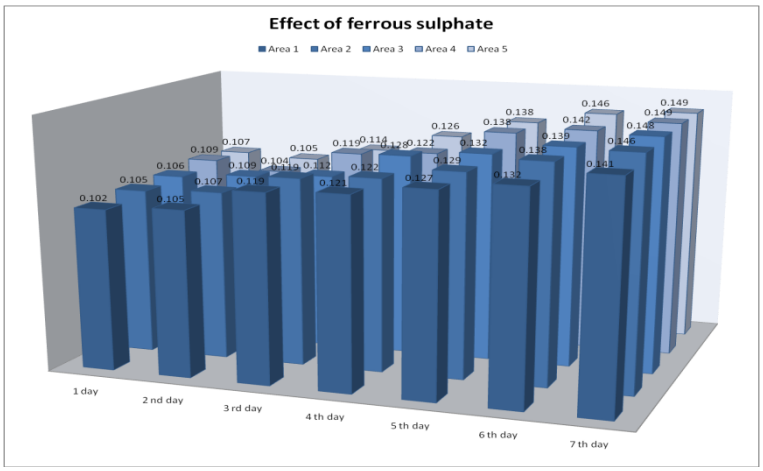

Figure: **Effect of ferrous sulphate on storage duration of water**

Table: Effect of ferric chloride (FeCl3) on storage duration of water

Sample	1 day	2 nd day	3 rd day	4 th day	5 th day	6 th day	7 th day
Area 1	0.091	0.101	0.109	0.111	0.117	0.122	0.131
Area 2	0.092	0.107	0.109	0.112	0.119	0.128	0.136

Area 3	0.096	0.109	0.112	0.118	0.122	0.129	0.138
Area 4	0.099	0.104	0.109	0.112	0.118	0.122	0.129
Area 5	0.097	0.105	0.114	0.116	0.118	0.126	0.129

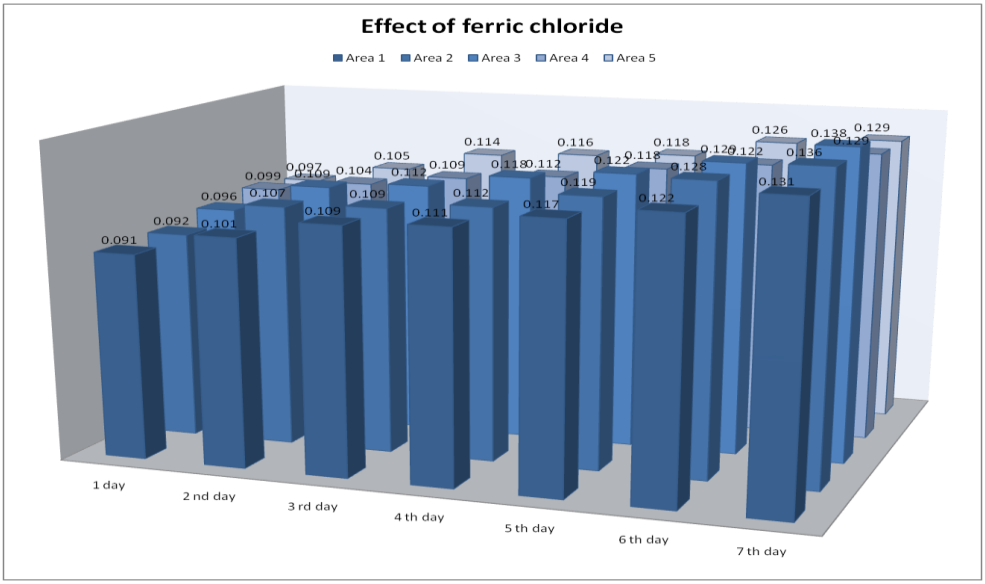

Figure: **Effect of ferric chloride on storage duration of water**

IV. Conclusion:

From the above experiment it can be concluded that ferric chloride has highest effect as disinfectant for storage of water, after that ferrous sulphate and after that aluminium sulphate. Rather the ferric chloride have the highest effect on the surpassing of slimy mould colony growth in drinking water storage tank.

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