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Use of Different Metal Chlorides and Acetates as Road Salts and the Study of their Consequent Effects on Water Quality Parameters

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Abstract: ***Highway salts are crucial to the transportation and highway maintenance enterprises in India or elsewhere to diminish glaze formation and sustain traffic safety in frigid climatic provinces like Kashmir, Ladakh, and Himachal Pradesh. However, increased highway salts usage and resulting in source water contamination have the prevailing essence for the putrefaction of drinking water infrastructure and damage to foliage along the roadside and aquatic ecosystems. This study circulates around the use of various types of salts, and their impacts on water quality parameters and focuses on the selection of most effective, economical salt to reduce ice formation on roads.***
Keywords: Water Quality Parameters, Chloride Content, Dissolved Oxygen, Road Salts, Potassium Acetate, Hardness, Alkalinity.

I. INTRODUCTION

In snow sash regions we contemplate road salt to be crucial for the safety of drivers and important to sustaining our business community in the winter. The implication of salt for melting glaze on roads drawn out into streams, rivers, etc. affects environmental wellness. Furthermore, changes in water quality parameters, cause sabotage in the aquatic life in general and various diseases in human beings. Road salts contain different mixtures such as sodium and chloride and the presence of chloride in water impacts aquatic life. Surplus salt concentration can deteriorate entire aquatic food chains, containing zooplankton, salamanders and frogs, fish, shellfish, and aquatic plants. Moreover, it impacts soil fertility which indirectly affects agriculture production as it absorbs moisture results dehydration and eventually killing off crops



Fig. Ice Formation on Roads

II. SCOPE OF THE STUDY

The scope of this study is in the following areas: -

1) Efficient ice melting process on the roads during winter.
2) Determination of effect of road salts on the water body and aquatic life.

III. TEST METHODOLOGY

A sample of water was taken from the river Jhelum for testing and tests for time taken to melt the ice such as, change in temperature, PH, Alkalinity, Dissolved Oxygen (DO), Fluoride content, iron, Ammonium, Nitrite, Nitrate, Calcium hardness, Hardness, Silicate, Phosphate, Chloride Content, were conducted. After testing, the Virgin sample of water is filled into several trays of a given volume and then placed in the freezer for 15 hours duration for freezing.

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After that, different salts such as Common salt, Rock salt, sodium acetate, potassium acetate, were applied in different trays containing frozen water and the above-mentioned tests were repeated for all the salts.

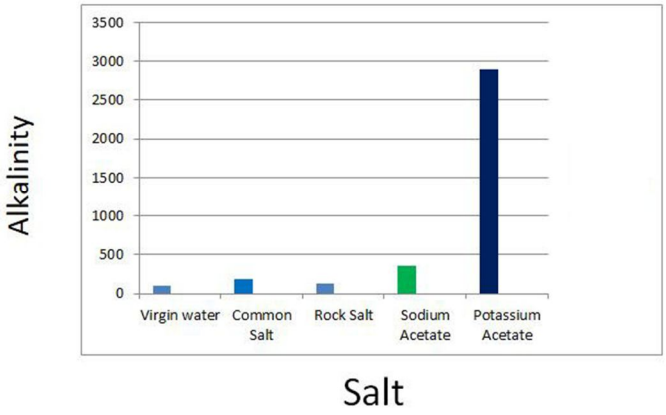
IV. RESULTS

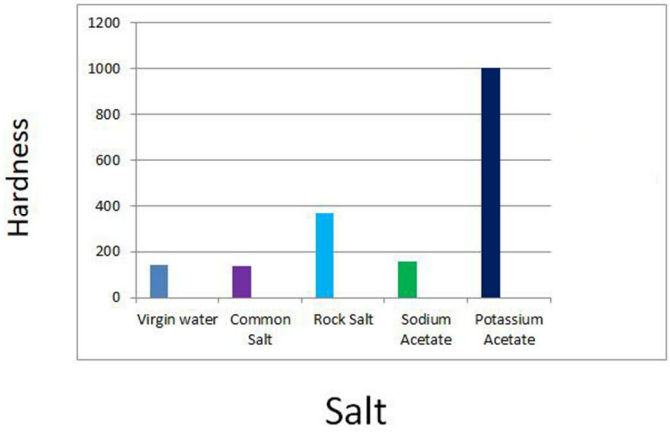
The Results and inferences of the tests conducted are tabulated below: -

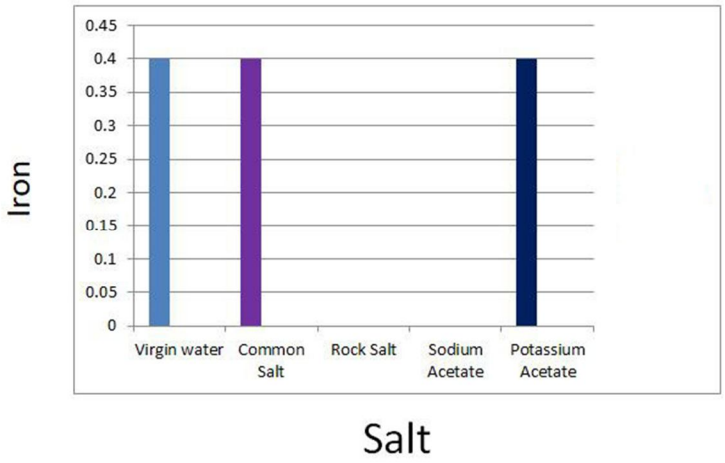
S.NO	Test	Virgin Sample	Common Salt	Rock Salt	Sodium Acetate	Potassium Acetate
1	Time	--------	2.05hr	2.10hr	2.50hr	2.15hr
2	Temperature	24	6.8	5	10	10
3	PH	8	8	7	8	8
4	Alkalinity	100	185	125	360	2900
5	Calcium Hardness	130	200	275	660	776
6	Hardness	140	135	370	155	1000
7	Phosphate	0.5	0	0	0	0.5
8	Iron	0.4	0.4	0	0	0.4
9	Nitrite	0.7	0.7	0.7	0.7	0.7
10	Nitrate	6	6	55	15	6
11	Silicate	6	20	5	0	0
12	Fluoride	0.5	0.5	0	0	0
13	DO	7	7	7	550	365

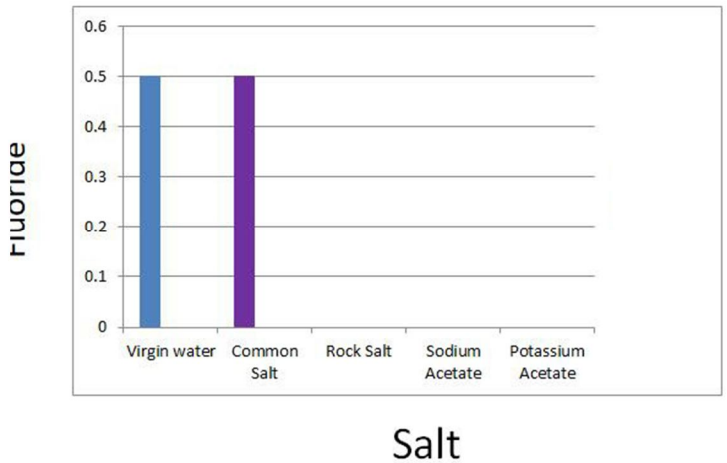
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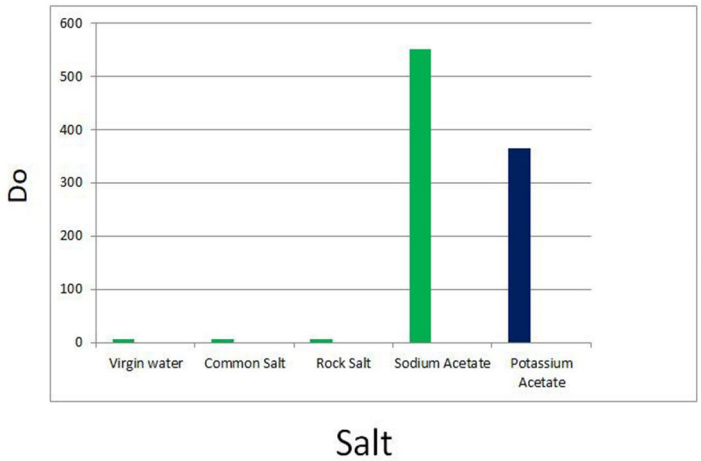
The results are shown in the bar graph as: -

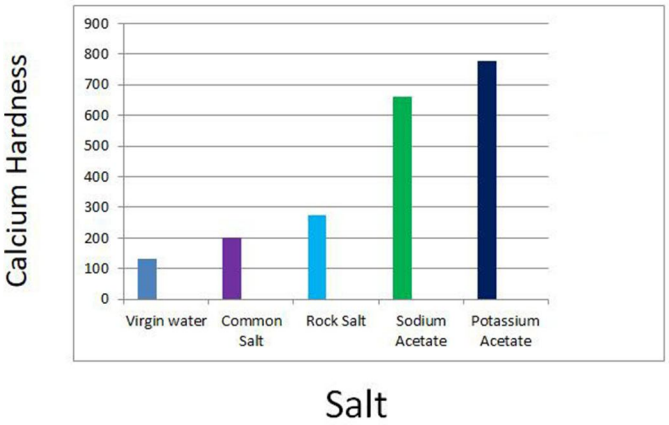


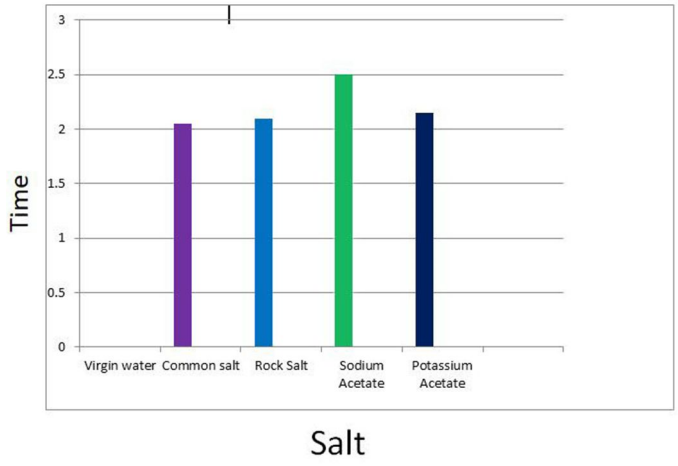


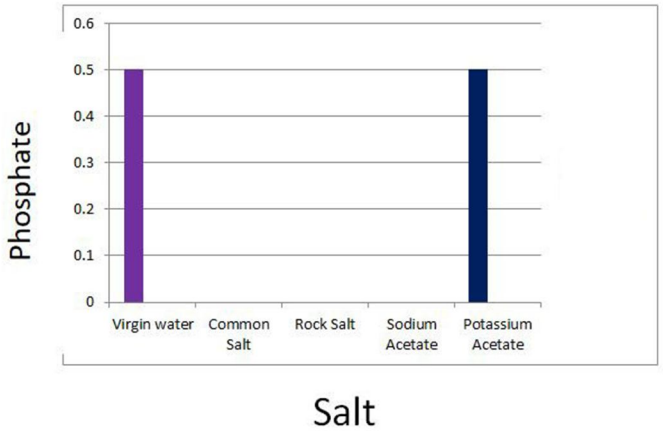












V. CONCLUSION

The conclusions drawn from the study are: -

1) Common salt (NaCl) is more effective and comical used for deicing on Roads.

2) Salt is a composition of sodium and chloride, the presence of chloride is toxic to aquatic life, and even low concentrations can stimulate destructive effects in freshwater ecosystems. Elevated chloride levels in water can inhibit marine species' growth and reproduction, influence food sources, and disrupt osmoregulation in amphibians

3) Salinity of water affects agricultural production because it reduces the moisture content obtainable to the plants, dehydration, and finally kills the plant

VI. RECOMMENDATIONS

Based on the above results, following recommendation are made: -

1) Common salt is to be applied for de-icing, if the funds available are limited.

2) Sodium acetate or potassium acetate is to be applied if water quality parameters were taken into consideration.

For quick de-icing, common salt is used to reduce ice formation on roads.

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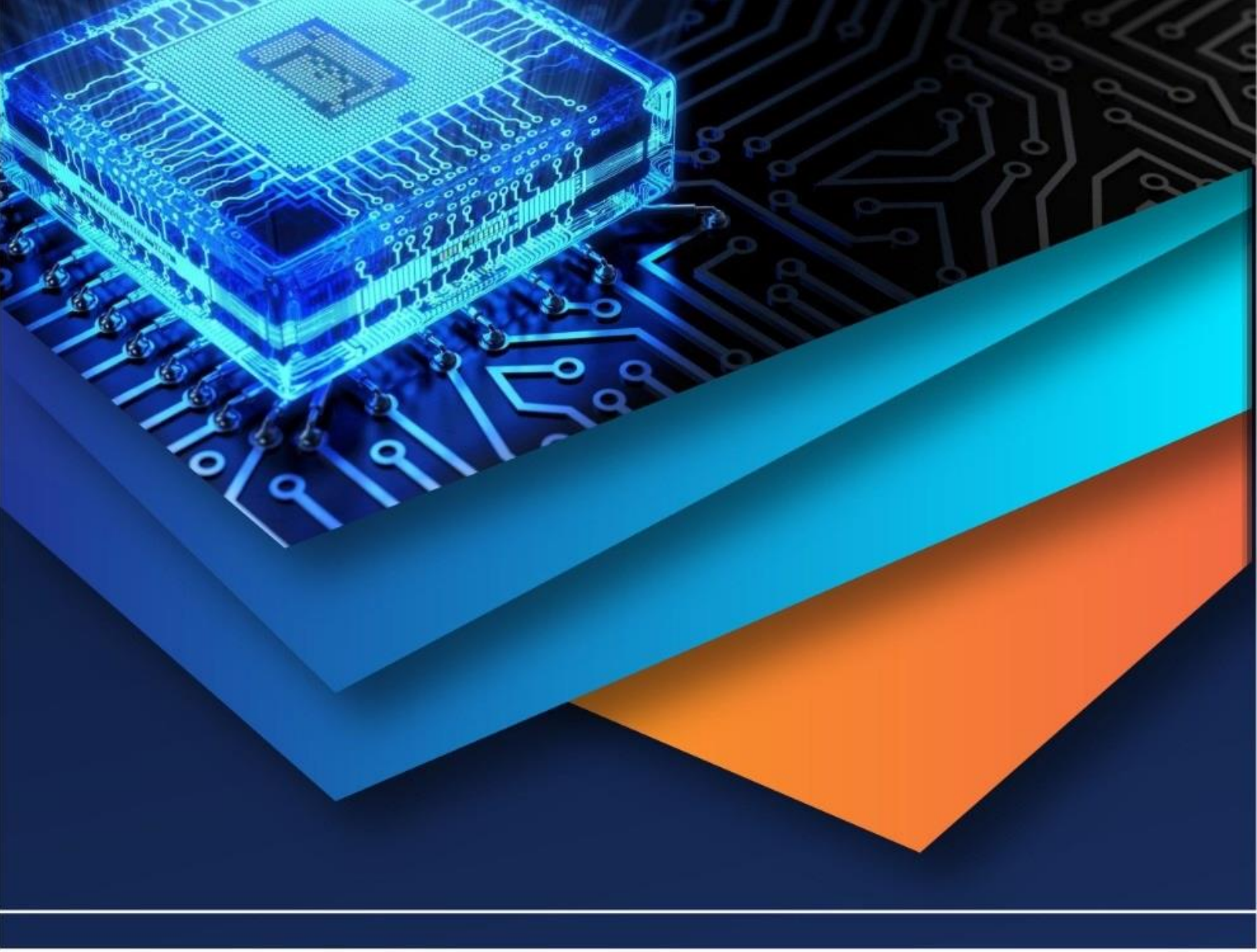
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