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Short Communication

STUDY OF THE CORRODING EFFECT OF ORANGE FRUIT BY CORROSIVE POLLUTANTS

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ABSTRACT
Orange is a very important citrus fruit of India. It is good revenue generating fruit crops of Indian farmer. It is also one of the richest sources of vitamin C. There are several eatable food products and soft juices prepared using orange. It is cultivated mostly in Bidarava region of Maharastra. Recently in these areas fast industrialization and infrastructure development works have generated huge amounts of pollutants and particulates. Pollutants are oxide of carbon, oxide of nitrogen, oxide of sulphur, hydrogen sulfide, oxide of chlorine, chloride ions, ammonia, organic acids and aldehydes where as particulates are dust, smoke, mist and fog. These particulates are deposited on the surface of orange flowers. Some of these particulates are hygroscopic in nature. They absorb water and pollutants and form acids. These acids in turn develop micro electrochemical cell within the flowers of orange and destroy the flowering.

***Key words**:* Orange flowers, Pollutants, Particulates, Micro electrochemical cell.

INTRODUCTION

Orange is cultivated in Nagpur and other areas of Maharastra. These areas are flooded with industries [Stern A C (1976), Pitts B J (1986), Wayne R P (1991), McEwan Murray J. and Philips Leon F (1975), Crwford M (1976)] like chemical, coal, fertilizer, petroleum refinery, food processing, transport industry, coal power, hydropower, drug industry, pulp and paper industry, paint and dyes, sugar industry, wine industry, water bottling plant, juice factory, milk processing, etc. These industries release huge amount of pollutants [Perkins H C (1974), Williamson J (1973), Sugden (Ed) T M (1978), Masters G M (1994)] like inorganic, organic and particulates material. They pollute air and that polluted air produces several problems for living and nonliving things. Inorganic pollutants are oxide of carbon (CO, CO_2), oxide of nitrogen (NO, N_2O, NO_2), oxide of sulphur (SO_2, SO_3), oxide of chlorine, chlorine ion, ammonia and oxide of metal. Organic pollutants are organic acid, aldeyhde, ketone, amine etc. Particulates [Bunce Nigel J (1991), Ghassemi A & Dekker M (2002).] [10-11] are dust, smoke, mist, pollen, bacteria and fog.
Particulates are scattered into the atmosphere which are deposited on the surface of orange flowers. Some of these particulates are hygroscopic [David T Allen and David R (2003)] in nature. They absorb moisture [Asthana D K and Asthana Meera (1998)] from the atmosphere. The moist particulates [Manahan SE (1893)] absorb oxide of carbon, oxide of nitrogen, oxide of sulpher, oxide of chlorine and chlorine ion to form carbonic acid, nitric acid, sulphuric acid, hypochlorous acid and hydrochloric acid. These acids are highly corrosive in nature. They create hostile environment for orange flowers. The corrosive acid produces micro electrochemical cell within the orange flowers thus electrochemical reaction occurs on the surface of orange flowers and in this way flowers of orange get destroyed and conversion of flowers into orange is decreased. The main objective of this work is to spread the message about air pollutants and cultivate among people general awareness so that the crops can be saved from such harmful effects. The aim is to enhance the production of this economy earning fruit.

MATERIALS AND METHODS

For this work certain orange growing areas were selected like Nagpur, Wardha, Solapur and Ahamadanagar. The study of the characteristic behaviors of inorganic, organic and particulates pollutants and their effect on orange flowers were done in detail. Corrosive gases and their acidic character were determined with the help of Pen type pH meter.

RESULTS AND DISCUSSION

Being a highly populated country India has so many basic needs to fulfill, such as food, cloth, house, education, hospital, electricity, transport, road and telecommunication etc. We are not utilizing our natural resources in proper manner. Man creates its own environment. Recently infrastructure development works are going very fast in several sectors like agriculture, power generation, construction etc. These sectors are playing major roles in polluting our environment. The quality of orange fruit depends upon the temperature, humidity and nature of surrounding

environment during its flowering period. High concentrations of corrosive gases, particulate materials and humidity result into formation of H_2CO_3, HNO_3, H_2SO_4, HClO and HCl. These acids produce H^+ ion that ion starts electrochemical reaction with orange flowers. Due to this reaction flowers connectivity become weaker and finally they are detached from the main branch of orange plant. During the formation of acids exothermic reaction occurs and heat is evolved which increases the temperature of surrounding of orange flowers, thus flowers are easily separated from its main branch.

The chemical reactions among them are written as:

$$CO_2 + H_2O \rightarrow H_2CO_3$$
$$NO + O_2 \rightarrow NO_2$$
$$NO_2 + H_2O \rightarrow HNO_3$$
$$SO2 + O_2 \rightarrow SO_3$$
$$SO_3 + H_2O \rightarrow H_2SO_4$$
$$Cl^- + H_2O \rightarrow HCl + ClO^-$$

The above mentioned acids release H^+ ions that ions develop an electrochemical cell causing oxidation and reduction reactions to start on the surface of orange flowers .The electrochemical reaction is expressed as:

Half Oxidation Reaction

$$CH_2O \rightarrow CO_2 + 2H^+ + 2e$$

Half Reduction Reaction

$$2H^+ + 2e \rightarrow H_2$$

This chemical reaction indicates that corrosive pollutants are corroding the orange flowers. The pH values of some cities are recorded in Table 1 and bar graph has been plotted between the pH values of corrosive pollutants and its concentrations in different cities. The results of Table 1 and Fig. 1 show that the concentration of H^+ ion in Nagpur city is higher than that of Wardha. Likewise the concentration of H^+ ion in Solapur is greater than Ahmadnagar and orange crops of these areas are badly affected by pollutants.

Table1. pH values of corrosive pollutants in different Cities (2011)

City	Nagpur	Wardha	Solapur	Ahamadnagar
pH	5.8	6.1	6.3	6.5

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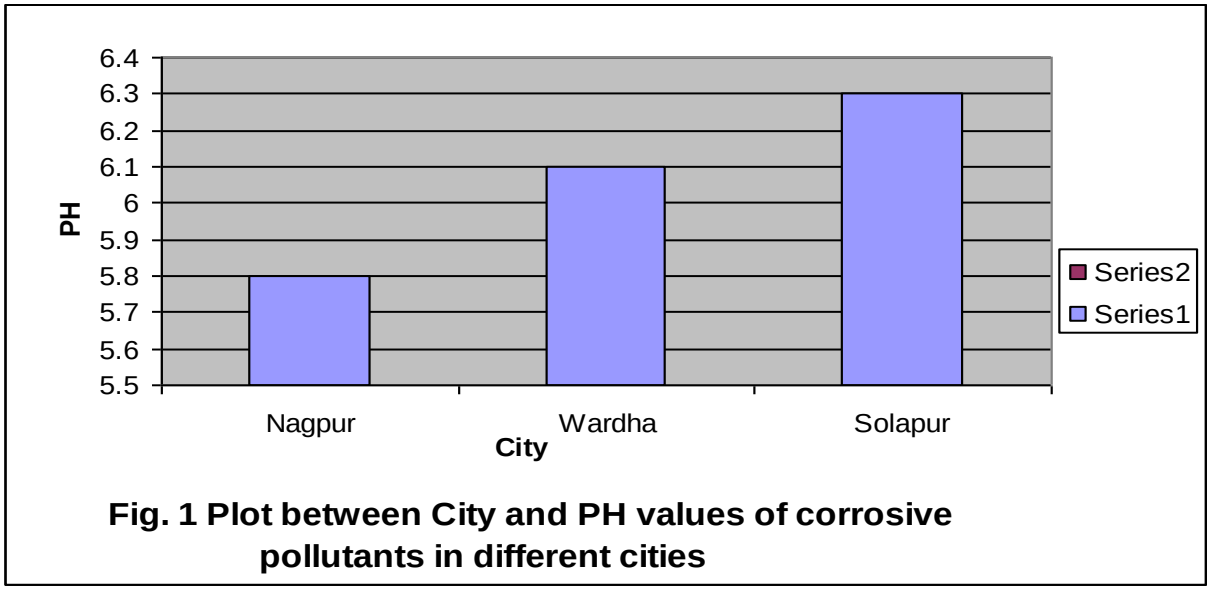

Fig. 1 Plot between City and PH values of corrosive pollutants in different cities

The concentration of carbon dioxide and methane gases are increasing in atmosphere due to deforestation, industrialization and human waste decomposition. These gases produce global warming effect thus temperature of atmosphere is increased which exhibits bad affect on the orange flowers. In lower level of atmosphere ozone is formed and that ozone also disturbs orange flowers.

$O_2 + UV \rightarrow 2O$
$O_2 + O \rightarrow O_3$

Pollutants are very harmful for orange flowers. They decrease its production. If its involvement is not controlled at proper time, our country will become major loser of orange. It is moral responsibility of the industrialists, scientists, intellectuals, social workers to provide good technology and public awareness against pollution.

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