Journal of Current Chemical & Pharmaceutical Sciences

J. Curr. Chem. Pharm. Sc.: 2(4), 2012, 306-309
ISSN 2277-2871

TUHAR (*CAJANUS CAJAN*) PULSE FLOWERS CORRODING BY CORROSIVE POLLUTANTS

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(*Received : 07.09.2012; Revised : 12.09.2012; Accepted : 14.09.2012*)

ABSTRACT

Tuhar pulse is a very important crop of Indian farmers. It is one of the most proteinous foods of Public. It is common food for Indian people. It is cultivated mostly in Madhya Pradesh, Rajasthan, Gujarat, Maharastra, Uttar Pradesh, Bihar and West Bengal. Recently, in these states industrialization and infrastructure development works are going very fast causing huge amounts of pollutants and particulate entering into the atmosphere. Pollutants are oxide of carbon, oxide of nitrogen, oxide of sulphur, oxide of chlorine, chloride ions, ammonia, organic acids and aldehydes, where as particulates are dust, smoke, mist and fog. Particulates are deposited on the surface of Tuhar pulse flower. Some of these particulates are hygroscopic in nature. They absorb pollutants and form acids. These acids in turn develop micro-electrochemical cell with flower of Tuhar pulse, which destroy flowering of Tuhar pulse. Other factors are acid rain, global warming and depletion of ozone layer affecting the production of Tuhar pulse.

Key words: Tuhar pulse flowers, Pollutants, Particulates, Micro-electrochemical cell, Acid rain, Global warming, Ozone depletion.

INTRODUCTION

Tuhar pulse is cultivated in the Basin of Ganga River, Yamuna, Gomati, Narmada, Godawari, Mahananda and other areas. These areas are flooded with industries 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.[1-5] These industries release huge amount of pollutants like inorganic, organic and particulates material[6-9]. 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 are dust, smoke, mist, pollen, bacteria and fog[10-11].

Tuhar pulse flowering period starts from December to February. Particulates are scattered into the atmosphere, which are deposited on the surface of Tuhar pulse. Some of these particulates are hydroscopic in nature[12]. They absorb moisture from the atmosphere[13]. The moist particulates 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[14]. These acids are highly corrosive in nature. They create hostile environment for Tuhar pulse flowers. The corrosive acid produces micro-electrochemical cell

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with Tuhar pulse flowers thus electrochemical reaction occurs on the surface of tuhar flowers. In this way flowers of Tuhar pulse get destroyed and conversion of flowers into Tuhar pulse is decreased.

Methodology

For this work, certain Tuhar pulse growing areas were selected like Chindwara in Madhya Pradesh, Bharatpur in Rajasthan, Lucknow in Uttar Pradesh and Patna in Bihar. The study of the characteristic behaviors of inorganic, organic and particulates pollutants and their effect on Tuhar pulse flowers were done in detail. Monitoring works started during period of December to February. Corrosive gases and their acidic character were determined with the help of Pen types pH meter.

RESULTS AND DISCUSSION

Tuhar pulse is one of the main foods of Indian people. Our country is highly populated. Our public have so many basic needs like food, cloth, house, education, hospital, electricity, transport, road, industry and telecommunication. For the completion of these basic needs, we do not utilize our natural resources in proper manner. Man creates its own environments. The infrastructure development works are going very fast in several sectors like industry, agriculture, power generation, construction etc. These sectors have major role in pollution of environment. The main features of Tuhar depend upon temperature, humidity and nature of surrounding environment during its flowering period. The concentration of corrosive gases, particulate materials and humidity are high so they form H_2CO_3, HNO_3, H_2SO_4, HClO and HCl. These acids produce H^+ ion that ion starts electrochemical reaction with Tuhar flowers. Due to this reaction flowers connectivity becomes weaker and finally they are detached from the main branch of Tuhar plant. During the formation of acids exothermic reaction occurs and heat is evolved, which increases the temperature of surrounding of tuhar flowers, causing the separation of Tuhar flowers from its main branch.

The chemical reactions among them are written as –

$$CO_2 + H_2O \rightarrow H_2CO_3$$

$$NO + O_2 \rightarrow NO_2$$

$$NO_2 + H_2O \rightarrow HNO_3$$

$$SO_2 + O_2 \rightarrow SO_3$$

$$SO_3 + H_2O \rightarrow H_2SO_4$$

$$Cl^- + H_2O \rightarrow HCl + ClO^-$$

The above mentioned acids are dissociated and released H^+ ion that ions in the presence of electrolytes develop an electrochemical cell causing oxidation and reduction reactions to start on the surface of Tuhar pulse 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 Tuhar pulse flowers. The pH values of above mentioned cities are recorded in Table 1 and bar graph plots 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 Chindwara city is higher than that of Lucknow. Likewise the concentration of H^+ ion in Bharatpur is greater than Patna and Tuhar pulse crops of these areas are badly affected by pollutants.

Table 1: pH Values of corrosive pollutants in different Cities

City	Chindwara	Lucknow	Bharatpur	Patna
pH	5.6	5.8	6.3	6.5

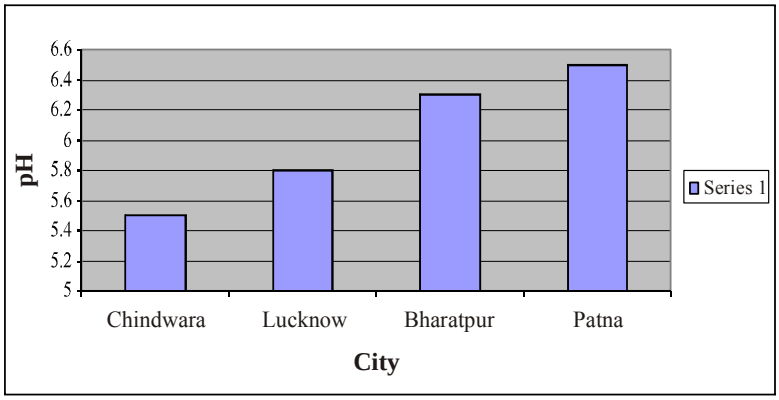

Fig. 1: Plot between City and pH values of acids in different Cities

The concentration of carbon dioxide and methane gases increases 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 Tuhar pulse flowers. In lower level of atmosphere ozone is formed and that ozone also disturbs Tuhar pulse flowers.

$$O_2 + UV \rightarrow 2O$$

$$O_2 + O \rightarrow O_3$$

CONCLUSION

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

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