



Adsorption Efficiency of Carbon Prepared from Agricultural Waste Materials in Removing Basic Dye From Aqueous Solution

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Management of solid waste is the burgeoning issue of the current times. Agriculture waste is rich in organic material like cellulose, lignin *etc.* and can be of great use if utilized as right resource at right time and right place. In the current study agriculture waste material has been used for adsorption of colour from waste water. Sugarcane bagasse and paddy straw have been recycled to activated carbon and have been utilized and compared as the adsorbent for the removal of basic dye from aqueous solution. A basic dye, methylene blue has been used as the adsorbate. Two different mineral acids have been used for activation of raw material and it was observed that both H_3PO_4 and HNO_3 were good activating agent but impregnation efficiency was in following order $H_3PO_4 > HNO_3$. Adsorption experiments were conducted by varying several parameters namely pH, adsorbent dose, initial concentration of dye and contact time. It was observed that colour was effectively removed at all selected pH and the increase in activated carbon dose showed an increase in its adsorption efficiency. The percentage of colour removal decreased with an increase in the initial dye concentration. More than 90 % adsorption efficiency of dye from solution containing 10 mg/L of dye was attained with an adsorbent dosage of 0.1 g after 45 min of contact time at all pH. Results obtained indicate that agriculture waste material could be employed as a low cost alternative to commercial activated carbon in wastewater treatment for dye removal and can thus be a good example of wealth from waste.

Key Words: Activated carbon, Adsorption, Methylene blue, Paddy straw, Sugarcane bagasse.

INTRODUCTION

Water pollution and improper waste management is an issue of global concern. A large part of every country's wealth is being used up for both liquid and solid waste management but anything sustainable is still not achieved. Coloured effluent is one of the major problems which is released from textile industries. This coloured wastewater is produced due to maximum use of dyes by textile industries to colour their products. The discharge of highly coloured effluents into natural water bodies is not only aesthetically displeasing, but it also impedes light penetration, thus upsetting biological processes within a stream. In addition, many dyes are toxic to some organisms causing direct destruction of aquatic communities. Among the various classes of dyes, basic dyes are found to be the brightest class of soluble dyes used by the textile industry as their tinctorial value is very high¹. Methylene blue is one such basic dyes which causes eye burns and may be responsible for permanent injury to the eyes of human and animals. It gets dissociated into methylene blue cation and chloride anion. Dissociated methylene blue is preferentially adsorbed onto many solids². It is difficult to remove the dyes from effluent since the dyes are stable to light and heat and are also biologically non-

degradable. Coagulation and flocculation are the two commonly used treatments methods for the removal of dyes. However these methods are very expensive. Adsorption processes using activated carbons are widely used to remove pollutants from wastewaters. It is one of the effective methods for removal of dyes from waste effluent. Adsorption is a good alternative for industrial waste streams containing a high percentage of molecules that are not readily biodegradable. Experience has shown, however, that molecular weight is the principal factor and that molecules possessing three or more carbon atoms usually respond favourably to adsorption treatment³. The process of adsorption has an edge over the other methods due to its sludge free clean operation and complete removal of dyes even from dilute solutions⁴. Activated carbon is widely used as an adsorbent for many species of pollutants because of its high and wide affinity. However, commercially available activated carbon is expensive. Thus other cheap alternatives should be tested for dye removal from waste waters. Recycling of agriculture waste material which is a natural renewable resource that can be converted into useful materials and energy can be a solution to waste management and an alternative to expensive activated carbon. Thus in the current study activated carbon prepared from waste sugarcane bagasse and paddy straw were