domestic sewage, urban run-off, industrial emission and agriculture wastewater. Sewage treatment plants and industry including food processing, pulp and paper making, farming and aquaculture. During the decomposition process of organic pollutants the dissolved oxygen in the collect water may be consumed at a greater rate than it can be recharge, causing oxygen depletion and having severe consequences for the stream biota.

Among various water purification and reclaim technologies, adsorption is a fast, inexpensive and universal method. The development of low-cost adsorbents has led to the quick growth of research interests in this field. adsorption and details experimental methodologies for the development and characterization of low-cost adsorbents, water treatment and recycling using adsorption technology including reduction of COD and BOD in waste water.

II. MATERIALS IN WASTE WATER AND ITS ADVERSE EFFECT

Improper disposal of waste water and the problems of addressing challenges from wastewater discharge into water bodies have led to an increase in the rate of wastewater generation. Abattoir wastes, industrial wastes from breweries, agricultural runoffs, and waste water from car wash located close to the Ganga River have adverse effects on the water quality. High levels of pollutants in river cause an increase in (BOD) biological oxygen demand, (COD) chemical oxygen demand, (TDS) total dissolved solids, and (TSS) total suspended solids. Toxic metals such as Cd, Cr, Ni and Pb make such water inappropriate for drinking, irrigation, aquatic lives and even pose a great risk to human health.

III. ADSORPTION

Adsorption is a process that results in the removal of a solute from a solution and concentrating it at the surface of the adsorbent, until the amount of the solute remaining in the solution is in equilibrium with that at the surface. Waste waters in Toxic organic pollutants cause several environmental problems to our environment. The most common organic pollutants named persistent organic pollutants. Efficient techniques for the removal of highly toxic organic compounds from waste water have drawn significant interest in waste water treatment process.

A number of various different methods such as coagulation, filtration with coagulation, precipitation, ozonation, adsorptions, ion exchange, reverse osmosis and advanced oxidation processes have been used for the removal of organic pollutants from polluted water and wastewater. These methods have been found to be limited for the waste water treatment purpose, since them have often involve high capital and operational costs. On the other hand ions exchange and reverse osmosis are more delightful processes because the pollutants values can be recovered along with their removal from the effluents. Adsorption process by solid adsorbent shows potential as one of the most efficient methods for the treatment and removal of organic contaminants in wastewater treatment. Advantages of adsorption over the other methods because of simple design and can involve less investment in term of both initial land required compare to other treatment method. The adsorption process is generally used for treatment of various industrial wastewaters from organic and inorganic pollutants. In recent years, the search for very low-cost adsorbents that have pollutant –binding capacities has intensified. Materials are easily available such as various the natural materials, industrial wastes and agricultural wastes can be utilized as low-cost adsorbents. Activated carbon produced from this material can be used as adsorbent for water and wastewater treatment.

IV. AGRICULTURE ADSORBENTS

Agricultural products and by-products is a plentiful waste material, and needs proper disposal. When disposed by burning in situ, it produce CO_2 and other forms of pollutions. This erects a need for the conversion of agricultural products and by-products to useful, and optimistic, value-added products. One possible avenue could be as reasonable ion exchange or adsorbent material, which could remove toxic metal ions from aqueous solutions. The idea of using various agricultural products and by-products for the removal of heavy metal from solution has been scrutinized by number of authors. The obvious advantages of this method compared to others are lower cost involved when biotic waste materials are used. The available literature as summarized in Table 1 shows that some of these non-covenantal adsorbents possess good adsorption of adsorbent in wastewater treatment.

A) Coconut Shell[18]

Devising of activated coconut husk:

Coconut husk was prepared by treating of coconut husk concentrated sulphuric acid and keeping it in an oven at 150° C for 24 hrs. The carbonized material was scour with distilled water to unfasten free acid and dried in oven.

Fig. 1: Coconut Husk

B) Lignin[19]

Lignin is a class of complex organic polymers that form lead structural materials in the reinforce tissues of vascular plants and some algae. Lignin are particularly paramount in the formation of cell walls, predominantly in wood, dry leaf and bark, because they lend rigidity and do not rot easily. Chemically, lignins are cross-linked phenolic polymers.

C) Bark[2]:

Bark is the extreme layers of stems and roots of woody plants. Plants with bark include trees, woody vines, and shrubs. Bark refers to all the tissues outside the vascular cambium and is a non technical term. It laminates the wood and consists of the inner bay and the outer bay. The inner yelp, which in older stalk is living tissue, includes the masked area of the perineum. The outer bark in older trunk includes the dead tissue on the surface of the stems, along with parts of the innermost perineum and all the tissues on the exterior of the perineum. The outer bark on trees which lies external to the last established perineum is also called the rhytidome.

Fig. 2: Bark

D) Corn Starch[20]

Corn starch or maize starch is the starch obtained from the corn (maize) grains. The starch is derived from the endosperm of the kernel. Corn starch is a habitual food ingredient, used in stiffening sauces or soups, and in making corn syrup and other sugars. It is resourceful, easily modified, and finds many uses in industry as bonding agent, in paper products, as an anti-sticking agent, and textile manufacturing. It has medical uses, such as to provide glucose for people with glycogen storage disease.

Many products in dust form, it can be precarious in large quantities due to its instability. When mixed with a fluid, cornstarch can rearrange itself into non-Newtonian fluids. For example, adding water transforms cornstarch into a material commonly known as Oobleck while adding oil transforms cornstarch into an electro-rheological (ER) fluid. The concept can be explained through the mixture termed "corn flour slime".

(pixabay)

Fig. 3: Corn Starch

E) Rice Husk & Bagasse ash[1]

The appeal of rice husk and bagasse ash as adsorbents to remove dyes from printing and textile wastewater and heavy metals, such as nickel from electroplating wastewater. Rice husk was used in removal of direct, basic and acid dyes. A study on the adsorption of basic dyes onto rice husk involved electrostatic interaction. Evidence manifest that cellulose, lignin and hemi-cellulose were the main components involved in dye adsorptions. Because of alterations to active –CH, −OH, ketone and carboxylate functional group, heating decreases the capability of rice husk to adsorb direct, basic and acid dyes. Rice husk has also been used to adsorb nickel from electroplating wastewater. Decolourization of vegetable oil and sugar syrup by these agricultural residues was also studied. Production of activated carbon from rice husk and bagasse ash was characterized and used for decolourization of vegetable oil such as rice bran oil. Bagasse ash was also applied in the decolourization of sugar syrup via a mechanism involving electrostatic interactions. Bagasse ash was utilize as an adsorbent in the treatment of wastewater containing water-based ink. In addition, bagasse ash can is used to adsorb dyes in wastewater before it is discharged into natural water systems.

F) Peanut Shell[5]

The paper has fabricated a thorough inquiry into the absorption propertie of metal ions by treated peanut shell. A method to collect various metal ions in aqueous solution with peanut shell was designed. The peanut shell powder was treated with formalin in a dilute sulfuric acid and then activated. Then it is use as adsorbent, its adsorption capacity is high as comapre to others and other adsorbent data are given below in following table 1 in mg/g.

S. No.	Adsorbent	Adsorbate	Adsorption capacity
1	Raw rice husk	Cd(II)	8.58 mg/g
2	Epichlorohydrin treated rice husk	Cd(II)	11.12 mg/g
3	NaOH treated rice husk	Cd(II)	20.24 mg/g
4	NaHCO3 treated rice husk	Cd(II)	16.18 mg/g
5	H3 PO4 -treated rice bran	Ni(II)	102 mg/g
6	Rice husk	Safranine	838 mg/g
7	Rice husk	Methylene blue	312 mg/g
8	Rice husk ash	Acid violet 54, acid violet 17, acid blue	99.4–155 mg/g
		15, acid violet 49 and acid red 119	
9	Rice husk ash	Methylene blue dye	690 mg/g
10	Rice husk ash	Indigo Carmine	29.3–65.9 mg/g
11	Rice husk carbon	Cr(VI)	45.6 mg/g
12	Rice husk	Basic blue 9	19.83 mg/g
13	Rice husk	Acid yellow 36	86.9 mg/g
14	Sulfuric acid and zinc chloride	Crystal violet	64.87 and 61.57 mg/g
	activated rice husk carbon		
15	Rice husk	p-Chlorophenol	14.36 mg/g
16	Rice husk	p-Nitrophenol	15.31 mg/g
17	Wheat bran	Pb(II)	69.0–87.0 mg/g

S. No.	Adsorbent	Adsorbate	Adsorption capacity
18	Wheat bran	Reactive blue 19, reactive red 195 and	117.6–196.1 mg/g
		reactive yellow 145	
19	Tea waste	Cu(II) and Pb(II)	48–65
20	Turkish tea waste	Cu(II) and Cd(II)	6.65–8.64 mg/g (Cu)
			2.59–11.29 mg/g (Cd)
21	Tea factory waste	Zn(II)	8.9 mg/g
22	Spent tea leaves	Methylene blue	300.05 mg/g
23	Tea waste	Methylene blue	86.16 mg/g
24	Blend coffee	Cu(II) and Cd(II)	2.0 mg/g
25	Coffee residue	Pb(II)	63 mg/g
26	Coir pith waste	Pb(II)	263 mg/g
27	Coir pith waste	Co(II), Cr(III) and Ni(II)	12.82, 11.56 and 15.95 mg/g
28	Coir pith waste	Rhodamine B and acid violet	2.56 and 8.06 mg/g
29	Coir pith	Congo red	6.72 mg/g
30	Coconut bunch waste	Methylene blue	70.92 mg/g
31	Coconut activated carbon	2,4,6-Trichlorophenol	716.10 mg/g
32	Coconut husk activated carbon	Methylene blue	434.78 mg/g
33	Functionalized coconut fibers	Cd(II)	0.2–5 mmol/g
34	Coconut copra meal	Cd(II)	4.99 mg/g
35	Male flower of coconut treated with	Crystal violet	60.42–85.84 mg/g
	H2 SO4 and H3 PO4		
36	EDTA-modified groundnut husk	Cd(II)	0.36 mmol/g
		Pb(II)	0.19 mmol/g
37	Peanut hull	Cu(II)	0.21 mmol/g
		Pb(II)	0.18 mmol/g
38	Peanut hull	Cu(II)	21.25 mg/g
39	Peanut husk	Neutral Red	37.5 mg/g
40	Orange peel	Ni(II)	158 mg/g
41	Orange peel	Acid violet 17	19.88 mg/g
42	Orange peel	Direct Red 23 and Direct Red 80	10.72 and 21.05 mg/g
43	Banana peel	Cd(II)	35.52 mg/g
44	Banana peel	Cr(VI)	131.56 mg/g
45	Banana peel	Phenolic compounds	689 mg/g
46	Banana peel	Methyl orange	17.2 mg/g
		Methylene blue	15.9 mg/g

S. No.	Adsorbent	Adsorbate	Adsorption capacity
		Rhodamine B	13.2 mg/g
		Congo red	11.2 mg/g
		Methyl violet	7.9 mg/g
		Amido black 10B	7.9 mg/g
47	Orange peel	Methyl orange	15.8 mg/g
		Methylene blue	13.9 mg/g
		Rhodamine B	9.1 mg/g
		Congo red	7.9 mg/g
		Methyl violet	6.1 mg/g
		Amido black 10B	3.8 mg/g
48	Pomelo peel	Cd(II)	21.83 mg/g
49	Mango peel	Cd(II)	68.92 mg/g
		Pb(II)	99.05 mg/g
50	Mango peel	Cu(II)	46.09 mg/g
		Ni(II)	39.75 mg/g
		Zn(II)	28.21 mg/g
51	Garlic peel	Methylene blue	82.64–142.86 mg/g
52	Waste jack fruit peel carbon	Malachite green	166.37 mg/g
53	Bael fruit shell	Cr(VI)	17.27 mg/g
54	Chestnut shell	Cu(II)	12.56 mg/g
55	Brazil nut shell	Methylene blue,	7.81 mg/g
		Indigo caramine dye	1.09 mg/g
56	Wood apple shell	Methylene blue	95.2 mg/g
		Crystal violet	130 mg/g
57	Hazelnut shell	Pb(II)	28.18 mg/g
	Almond shell		8.08 mg/g
58	$ZnCl_2$ -modified walnut shells	Hg(II)	151.5 mg/g
59	Hazelnut shell	Basic blue 9	8.82 mg/g
60	Papaya seed	Methylene blue	555.55 mg/g
61	Tamarind seed	Cr(VI)	29.7 mg/g
62	Palm seed coat	o-Cresol	19.58 mg/g
63	Rubber seed coat	Basic blue 3	227.27 mg/g
64	Pineapple stem waste	Methylene blue	119.05 mg/g
65	Sunflower stalks	Methylene blue and basic red 9	205 and 317 mg/g
66	Sunflower stalks	Copper, cadmium, zinc, and chromium	29.3 mg/g (Cu^{2+}), 30.73 mg/g (Zn^{2+}),
			42.18 mg/g (Cd^{2+}), 25.07 mg/g (Cr^{3+})

S. No.	Adsorbent	Adsorbate	Adsorption capacity
67	Grape bagasse	Cd(II)	0.774 mmol/g
		Pb(II)	0.428 mmol/g
68	Black gram husk	Pb, Cd, Zn, Cu and Ni	19.56–49.97 mg/g
69	Sugar beet pulp	Cu(II)	28.5 mg/g
70	Sugarcane bagasse	Cd(II)	38.03 mg/g
		Zn(II)	31.11 mg/g
71	Bagasse pith	Basic blue 69 and basic red 22	158 and 177 mg/g
72	Bagasse pith	Acid red 114 and acid blue 25	23 and 22 mg/g
73	Barley straw	Cu(II)	4.64 mg/g
		Pb(II)	23.2 mg/g
74	Silk cotton hull	Reactive blue MR	12.9 mg/g
75	Pearl millet husk	Methylene blue	82.37 mg/g
76	Cotton stalk	Remazol Black B	35.7 mg/g
	Cotton hull		50.9 mg/g
77	Maize cob	2,4-Dichlorophenol	17.94 mg/g
78	Date pits	Basic blue 9	17.3 mg/g
79	Palm pith carbon	2,4-Dichlorophenol	19.16 mg/g
80	Maize cob	Basic dyes (Astrazone blue and	160 and 94.5 mg/g
		maxilon red)	
81	Maize cob	Acid dyes (telon blue and erinoyl red)	47.7 and 41.4 mg/g
82	Pinewood	Acid blue 264	1176 mg/g
83	Pinewood	Basic blue 69	1119 mg/g
84	Pinewood	Basic blue 9	556 mg/g

Table: A Review table on Agriculture Adsorbents different capacities to absorb pollutants

V. CONCLUSION

Globally, agriculture is a major consumer of wastewater. The search for alternative irrigation sources is believed to be vital to ensure food safety and to preserve natural water bodies. The safe use of wastewater, as an alternative source of irrigation, is an acknowledged strategy for the efficient use and prevention of water pollution that is gaining increasing relevance worldwide, especially in countries confronted with water shortages. However, there are risks associated with this type of use that must be assessed against a local framework, considering soil as a receiving environment and ensuring pollution will not be transferred from one medium to another (water to soil). Country efforts should be targeted at quantitative risk assessments. This would allow a more optimal and prioritized management considering that agricultural reuse can cause a very real public health problem if the risk is not taken into account.

The risks of wastewater reuse in agriculture are extensive, ranging from changes to physicochemical and microbiological properties of soils to impacts on human health. In unfavorable economic conditions, the search for alternative irrigation sources irrigation, such as the reuse of raw or inadequately treated wastewater may result in avoidable risk factors. Thus, it is necessary to communicate the beneficial aspects of this practice, as well as the negative impacts and different low-cost strategies that contribute to the decision-making process and favor the adequate use of wastewater in agriculture.

The lack of quantitative evaluation of microbiological risk, referring to the concentration of helminths, is the missing piece that is required for the proper implementation of agricultural reuse. This deficiency has promoted the use of raw sewage water, triggered by the incipient development of norms and the standards of some countries that do not conform to global guidelines. In addition, the improvement of the detection technique of helminths should be the next milestone to eliminate subjectivity and to advance the safe reuse of residual water.

REFERENCES

[1] Hashem, A & M. Elhmmali, M & A. Hussein, Hussein & Senousi, MA. (2006). Utilization of Sawdust-Based Materials as Adsorbent for Wastewater Treatment

[2] AjayKumar et al., 2008; Mehmet et al., 2007; Bin et al., 2000

[3] Amarasinghe, Padma & Williams, Richard. (2007). Tea Waste as a Low Cost Adsorbent for The Removal of Cu and Pb from Wastewater. Chemical Engineering Journal. 132. 299-309. 10.1016/j.cej.2007.01.016.

[4] Feroz, S & Mahir Al Khusaibi, Thuriya & Dumaran, joefel jessica & Devi, Geetha & Lakkimsetty, Nageswara Rao. (2015). Treatment of dairy wastewater using orange and banana peels. Journal of Chemical and Pharmaceutical Research. 7. 1385-1391.

[5] Sadiq, Mohammad & Hussain, Sajid. (2013). An Efficient Activated Carbon for the Wastewater Treatment, Prepared from Peanut Shell. Modern Research in Catalysis. 2. 148-156. 10.4236/mrc.2013.24020.

[6] Sadiq, Mohammad & Hussain, Sajid. (2013). An Efficient Activated Carbon for the Wastewater Treatment, Prepared from Peanut Shell. Modern Research in Catalysis. 2. 148-156. 10.4236/mrc.2013.24020.

[7] Behara, Atul & Mitra, Jayati Chatterjee. (2016). Use of Leaves and Barks of Some Plants as Bio-Adsorbents in the Control of Methylene Blue Dye from Waste Water Discharge of some Industries. Journal of Chemistry and Chemical Sciences. 6. 1121-1136.

[8] Reza, Arif. (2013). BAGASSE AS AN ADSORBENT FOR THE WASTEWATER TREATMENT OF A COMPOSITE KNIT INDUSTRY.

[9] Bobade, Veena & Eshtiaghi, Nicky. (2015). Heavy Metals Removal from Wastewater by Adsorption Process: A Review.

[10] Aman, Tehseen & Ahmad Kazi, Asrar & Sabri, Muhammad Usman & Bano, Qudsia. (2008). Potato peels as solid waste for the removal of heavy metal copper(II) from waste water/industrial effluent. Colloids and surfaces. B, Biointerfaces. 63. 116-21. 10.1016/j.colsurfb.2007.11.013.

[11] Fouzi, N.F.A.M. & Ismail, M & Hussin, Zurhana & Mohd Jan, Sarah. (2018). Separation of Pb(II) from wastewater using untreated coconut (Cocos nucifera) frond powder. Malaysian Journal of Analytical Sciences. 22. 128-135. 10.17576/mjas-2018-2201-16.

[12] Solaiappan, Vishali & Rashmi, P & Karthikeyan, R. (2015). Evaluation of wasted biomaterial, crab shells (Portunus sanguinolentus), as a coagulant, in paint effluent treatment. Desalination and Water Treatment. 1-9. 10.1080/19443994.2015.1055812.

[13] Sophia, Carmalin & V M, Bhalambaal. (2015). Utilization of coconut shell carbon in the anode compartment of microbial desalination cell (MDC) for enhanced desalination and bio-electricity production. Journal of Environmental Chemical Engineering. 3. 10.1016/j.jece.2015.10.026.

[14] Kobayashi, Fumihisa & Kofuji, Rumiko & Yamashita, Yuya & Nakamura, Yoshitoshi. (2006). A novel treatment system of wastewater contaminated with copper by a moss. Biochemical Engineering Journal - BIOCHEM ENG J. 28. 295-298. 10.1016/j.bej.2005.11.013.

[15] C. Thanh, Nguyen & E. Simard, Ronald. (1973). Biological treatment of wastewater by yeasts. Journal - Water Pollution Control Federation. 45. 674-80.

[16] Sankaran, Sindhuja & Khanal, Samir & Jasti, Nagapadma & Jin, Bo & L. Pometto III, Anthony & Van Leeuwen, Hans. (2010). Use of Filamentous Fungi for Wastewater Treatment and Production of High Value Fungal Byproducts: A Review. Critical Reviews in Environmental Science and Technology - CRIT REV ENVIRON SCI TECHNOL. 40. 400-449. 10.1080/10643380802278943.

[17] Hwang, Jae-Hoon & Church, Jared & Lee, Seung-Jin & Park, Jungsu & Lee, Woo. (2016). Use of Microalgae for Advanced Wastewater Treatment and Sustainable Bioenergy Generation. Environmental Engineering Science. 33. 10.1089/ees.2016.0132.

[18] Mohan, Dinesh & P Singh, Kunwar & K Singh, Vinod. (2008). Wastewater Treatment Using Low Cost Activated Carbons Derived from Agricultural Byproducts – A Case Study. Journal of hazardous materials. 152. 1045-53. 10.1016/j.jhazmat.2007.07.079.

[19] Andersson, K.I. & Norgren, Magnus & Eriksson, Marie. (2009). Lignin removal from wastewater by adsorption. Proceedings - 2009 International Mechanical Pulping Conference, IMPC 2009. 280-285.

[20] Zhang, Chunyang & Zhang, Congju & Liu, Jianguang & Han, Lichao. (2011). Research progress on corn starch wastewater treatment process. ICAE 2011 Proceedings: 2011 International Conference on New Technology of Agricultural Engineering. 10.1109/ICAE.2011.5943873.