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Anti-Microbial Property of Abutilon Indicum: A Review

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ABSTRACT- For the past few years there has been a phenomenal rise in the cases of multi-drug resistance in microbes prompting the researchers to look into the newer anti-microbial agents. The goal of this study is to use an agar well test to evaluate the antibacterial activity of Abutilon indicum floral extract against Staphylococcus aureus and Escherichia coli. The flower extract of the ethanol (10µg/ml) was found to be highly active against Escherichia coli and Staphylococcus aureus as compared to the chloroform extract (10 µg/ml) towards the same bacterial species. The aqueous extract & DMSO had minimal efficacy towards all the 2 bacterial species studied. The known antibiotic, Chloramphenicol (10 µg/ml) however showed excellent activity against all 2 bacterial species. The plant is already well known in Ayurveda & as the plant has shown efficacy against 2 bacterial species, there is hope that many more anti-microbial agents would be discovered from this plant in the near future.

KEYWORDS- Abutilon indicum, Anti-Bacterial, Aqueous Extract, Chloroform Extract, Chloramphenicol.

I. INTRODUCTION

Multi-antibiotic resistant bacteria are a serious threat to world health, and this concern is exacerbated in Gram-negative (G-) bacteria. Thereby, the World Health Organization (WHO) reports focuses that the antibiotics or agents for treating G- pathogenic infections are most wanted (WHO 2017). As a result, developing new antibiotics using novel chemical scaffolds, as well as other strategies, is crucial to combating multi-antibiotic/drug-resistant (MDR) G- bacteria [1-3].

Nowadays, there are 3 main paths towards MDR G-bacteria, which includes discovery of novel antibiotics, creating new adjuvants of antibiotics & the screening for alternatives to the antibiotics. As of now creation of adjuvants of antibiotic, are important for treating bacterial infections. Unfortunately, finding new antibiotics with novel targets, particularly for G- bacteria, is very challenging. Unfortunately, many newly released antibiotics were Gram-positive (G+) antibiotics, meaning they were useless against Gram-negative bacteria [4-6].

Antibiotic adjuvants enhances antibiotic efficacy by inhibiting resistance, increasing the intracellular antibiotic amount, complementary bactericidal protocols, blocking regulatory routes, or increasing the host's reply to bacterial presence, as illustrated in the Figure 1 & Table 1. In the past, many adjuvants were employed in treatments that inhibited b-lactamases, which creates resistance to b-lactam ringed antibiotics. In Figure 2, there is illustration of ß-lactamases & their blockers & in Figure 3, there is illustration of the chemical formulas of some adjuvants of antibiotics [7-9].

Owing to the drying up of the pipeline of novel antibiotics due to the onset of rise of antibiotic resistant microbes, therefore many researchers are turning towards plants traditionally known to possess anti-microbial properties, one of such plant being Abutilon indicum which is traditionally known for its anti-microbial roles. Hence this plant was choosen for evaluating its anti-bacterial roles [10-12].

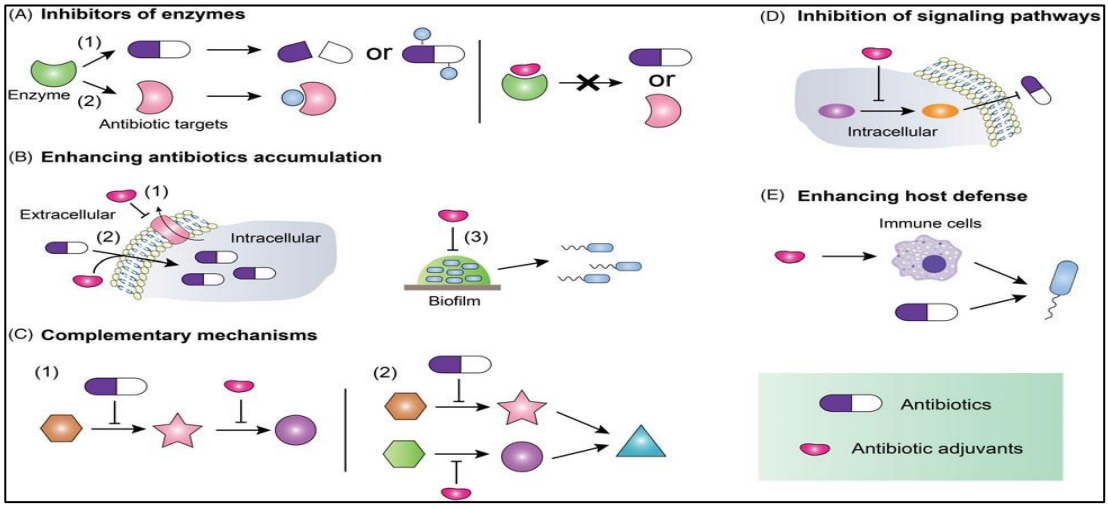

Figure. 1: Plan of mechanisms of activity of the adjuvants of antibiotic. (A) Blocker of the hydrolase activity of (B) Increasing the quantity of intracellular antibiotic by inhibiting efflux pumps (1) or assisting antibiotic passage through the membrane by using enzymes on antibiotics (1) or antibiotic earmarks; (2) or by annihilating the biofilm (3); (C)

Complementary modes (1) Antibiotics acting on the pathogen (2) Adjuvant helping the role of antibiotics (D) Blocking of regulatory routes that mediates resistance to antibiotics (E) Stimulating host immunity Figure courtesy[10-13]

Table 1: Antibiotic adjuvants having different mechanisms. The role of the adjuvants is to help the antibiotics to overcome microbial resistance, thereby acting as a facilitator for antibiotic roles [10]

Mechanisms	Pathogens	Adjuvants	Antibiotics	Targets
Inhibitor of resistance enzyme	G+/G-	Clavulanic acid	Amoxicillin	Type A ß-lactamase
	G+/G-	Avibactam	Ceftazidime/ceftarol ine	A/C ß-lactamase
	A. baumannii	ETX2514	ß-lactams	A/C/D ß-lactamase
	Enterobacteriac eae	VNRX-5133	Cefepime	All types of ß-lactamase
	MBL-+ve G-	Aspergillomarasm ine A	Meropenem	NDM, VIM
	E. coli	Cu2+	Carbapenem	NDM-1
	A. baumannii	PPMOs	Carbapenem	Bla NDM-1
	E. coli	Stigmasterol	Amphicillin	ß-lactamase
	K. pneumoniae	Vitamin E/K2	Multi-classes	Lipocalin
	P. aeruginosa	PPMOs	Polymixins	Mcr-1
	P. aeruginosa	Pterostilbene	Polymixins B	MCR-1
Enhancing antibiotic accumulation	*P. aeruginosa*	PAßN	Quinolones	RND pumps
	C. jejuni	Peptide nucleic acids (PNAs)	Ciprofloxacin	CmeABC pump
	E. coli	SLUPP	Erythromycin	AcrA protein
	Enterobacteriac ea	MBX	Ciprofloxacin	AcrA protein
	E. coli	A22	Novobiocin	MreB
	E. coli	PPMOs	Multi-classes	acrA
	A. baumannii	Pentamidine	Rifampicin	Lipid A
	P. aeruginosa	C_{12}-PRP	Rifampicin	Outer membrane
	E. coli	OAKs	Rifampicin	Outer membrane
	P. aeruginosa	Triclosan	Tobramycin	Outer membrane
Complementa ry bactericidal mechanisms	G+/G-	Trimethoprim	Sulfamethoxazole	Dihydroptero ate reductase
	G+/G-	ß-lactams	Aminoglycosides	Cell wall
Signal inhibition	E. coli	Pthalocyanine	Kanamycin	Rec A

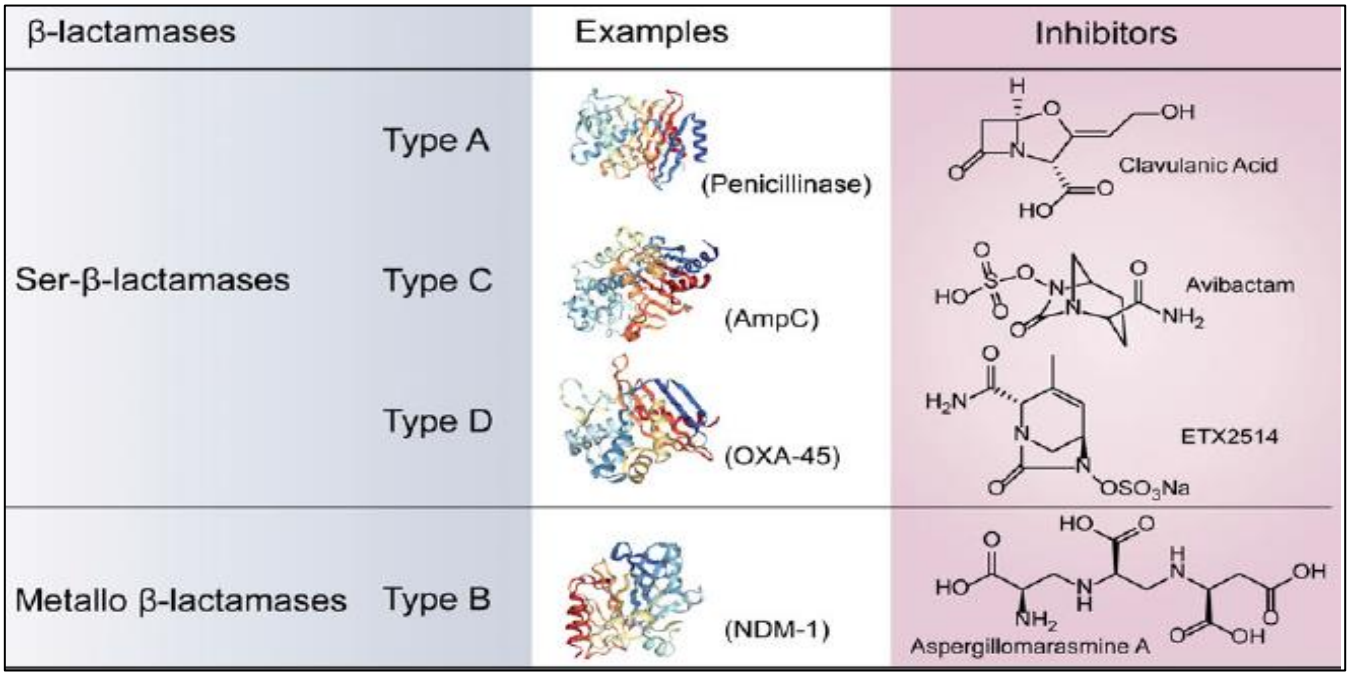

Figure 2: Creation of ß-lactamases & their blockers. ß-lactamases are being divided into serine & metallo ß -lactamases (MBLs) that are dependent upon their independent blocking mechanisms. Ser-ß-lactamases are classified into 3 types: A, C, & D by protein folding and specificity of substrate Figure courtesy [12]

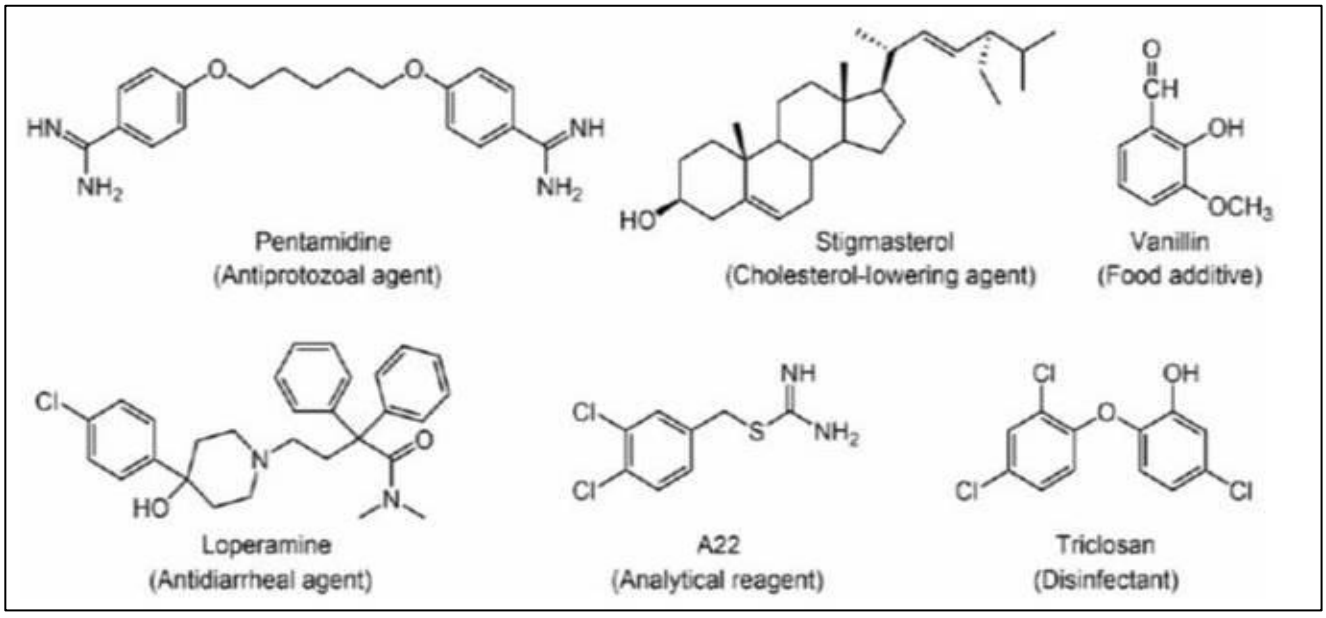

Figure 3: Chemical formulas of potential antibiotic adjuvants. These adjuvants are namely: Pentamidine, Stigmasterol, Vanillin, Loperamine, A22 & Triclosan Figure courtesy [12]

II. LITERATURE REVIEW

According to Shakeel Ahmad Khan's research, MnO nanoparticles (AI-MnO NAPs) were made using biological components from Abutilon indicum leaf extract. They were also tested against E. coli, Bordetella bronchiseptica, Staphylococcus aureus, and Bacillus subtilis bacteria, as well as HeLa carcinoma cells, for antibacterial and cytotoxicity. The capacity of synthesized NAPs to photocatalytically degrade methylene blue (MB) along with their adsorption ability against Cr were also investigated (VI). The effective synthesis of NAPs with a spherical shape and crystalline nature was validated by scanning electron microscopy (SEM), X-ray powder diffraction (XRD), Energy-dispersive X-ray (EDX), and Fourier-transform infrared spectroscopy (FTIR) tests. AI-MnO NAPs showed strong antibacterial and cytotoxicity against pathogenic microorganisms and malignant cells when compared to plant extract. Furthermore, synthesized AI-MnO NAPs showed biological activity findings that were similar to those of conventional medicines. The presence of living molecules on the surfaces of plants and the tiny particle size are credited with the outstanding biological activity findings (synergetic effect)(14). Synthesized NAPs are more capable of photocatalyzing MB than a UV lamp

when exposed to sunshine. The Cr(VI) adsorption results showed that at higher acidic pH, produced NAPs efficiently adsorbed more Cr(VI) than at basic pH. As a result, the current findings suggest that Abutilon indicum could be a beneficial tool for improving the biological, photocatalytic, and adsorption activities of NAPs. As a result, the AI-MnO NAPs synthesised by the plant employing biological components could be promising therapeutic options in the future [1] [5].

According to AbuOun M., mcr-1 and mcr-2 ariants were discovered in Moraxella spp. isolated from pooled caecal material of healthy pigs before slaughter collected from six farms in the United Kingdom. Other bacteria from the same farms, particularly Escherichia coli, were found to lack MCR-1 and mcr-2. MSG13-C03, a Moraxella porci-like isolate, included MCR-1.10, which had 98.7% identity to MCR-1, and MSG47-C17, a Moraxella pluranimalium-like isolate, contained MCR-2.2, which had 87.9% identity to MCR-2, both from E. coli, with colistin MICs of 1-2 mg/L, both from E. coli. Despite having the conserved nucleotides around the ISApl1 composite transposon found in E. coli plasmids and the intervening 2.6 kb stretch demonstrating 97 percent identity [16] [17], neither MSG13-C03 nor MSG47-C17 contained entire insertion elements [18]. Phosphoethanolamine transferase was found in six isolates of Moraxella osloensis (EptA) [15] [17] [18]. Phosphoethanolamine transferase was found in six isolates of Moraxella osloensis (EptA). With colistin MICs ranging from 2 to 4 mg/L, they showed 62 percent - 64.5 percent identity with MCR-1 and MCR-2. MCR and EptA developed from the same ancestor, according to phylogenetic analysis. Both isolates carried the -lactamase gene, blaBRO-1, in addition to mcr, while MSG47-C17 also had the tetracycline gene encoding, tetL[13] [4].

According to Md Kausar Alam's research, antibiotic resistance is caused by the survival of resistance mutations or genes acquired by adaptive de novo mutations or resistance gene transfer. Antibiotic resistance is caused through the activation of SOS-mediated DNA repair, mutagenesis, and horizontal gene transfer pathways in response to antibiotic therapy. The SOS pathway stimulates RecA, deactivates the LexA repressor, and promotes the expression of SOS genes when it is active [5]. Antibiotic-induced activation of the SOS response has been suppressed by RecA inhibitors based on phthalocyanine tetrasulfonic acid, which have been discovered and described. These inhibitors potentiate antibiotics from the quinolone, -lactam, and aminoglycoside families, as well as members of the quinolone, -lactam, and aminoglycoside families, in Gram-negative and Gram-positive bacteria. They inhibit the development of antibiotic resistance mutations in bacteria and the dissemination of resistance-inducing mobile genomic elements. This research highlights the importance of RecA inhibitors in bactericidal antibiotic treatments, as well as a novel technique for extending antibiotic shelf life [1] [7].

III. DISCUSSION

Firstly, flowers of the Abutilon indicum would be collected & their extracts were prepared. Strains of bacteria were cultured and the anti-bacterial role of these extracts were evaluated. The flowers of Abutilon indicum collected from the local nursery & a voucher specimen was submitted. The flowers were dried & pulverized into powder that was then extracted by using the Soxhlet device using ethanol (C2H5OH), chloroform (CHCl3) & water (H20). From each solvent extract, 155 milligrams were dissolved in 5 ml of Dimethyl Sulphoxide (DMSO) and stored in airtight containers. Through using agar well diffusion test, the antibacterial properties of the extracts were assessed against Escherichia coli and Staphylococcus aureus. The plates were prepared with Luria agar medium and put over them. Once the media in the plates got solidified, specific pure bacterial lawn culture was established, following which wells were punched into it via a 1mililiter sterile tip [8] [19]. Nearly 30 µl of each solvent extract (0, 1, 2.5, 5, 7.5 & 10 µg/ml) was separately poured into each well. Blank well having DMSO was noted as negative (-ve) control & wells having chloramphenicol (45 µg) as positive (+ve) control. Following incubation for 24 hours & at 37°Centrigrade, inhibition was observed by the measurement of the zone of inhibition's diameter. The experiments were repeated thrice [15] [20].

The anti-bacterial role of the flower extracts of the plant Abutilon indicum was evaluated on 2 bacterial species. The flower extract of the ethanol (10 µg/ml) was found to be highly active against Escherichia coli & Staphylococcus aureus as compared to the Chloroform extract (10 µg/ml) towards the same bacterial species. The aqueous extract & DMSO had minimal efficacy towards all the 2 bacterial species studied. The known antibiotic, Chloramphenicol (10 µg/ml) however showed excellent activity against all 2 bacterial species (Figure 5) (Table 2) [11] [21] [22] [23].

Table 2: Anti-bacterial role of the flowers of Abutilon indicum towards the bacterial species by the agar well assay. The flower extract of the ethanol (10 µg/ml) was found to be highly active against Escherichia coli & Staphylococcus aureus as compared to the Chloroform extract (10 µg/ml) towards the same bacterial species [11] [12]

Bacterial species		**Zone of inhibition (mm)**			
	DMSO	**Aqueous extract**	**Ethanol extract**	**Chloroform extract**	**Chloramphenicol**
Escherichia coli	1	2	13	14	31
Staphylococcus aureus	2	3	24	18	27

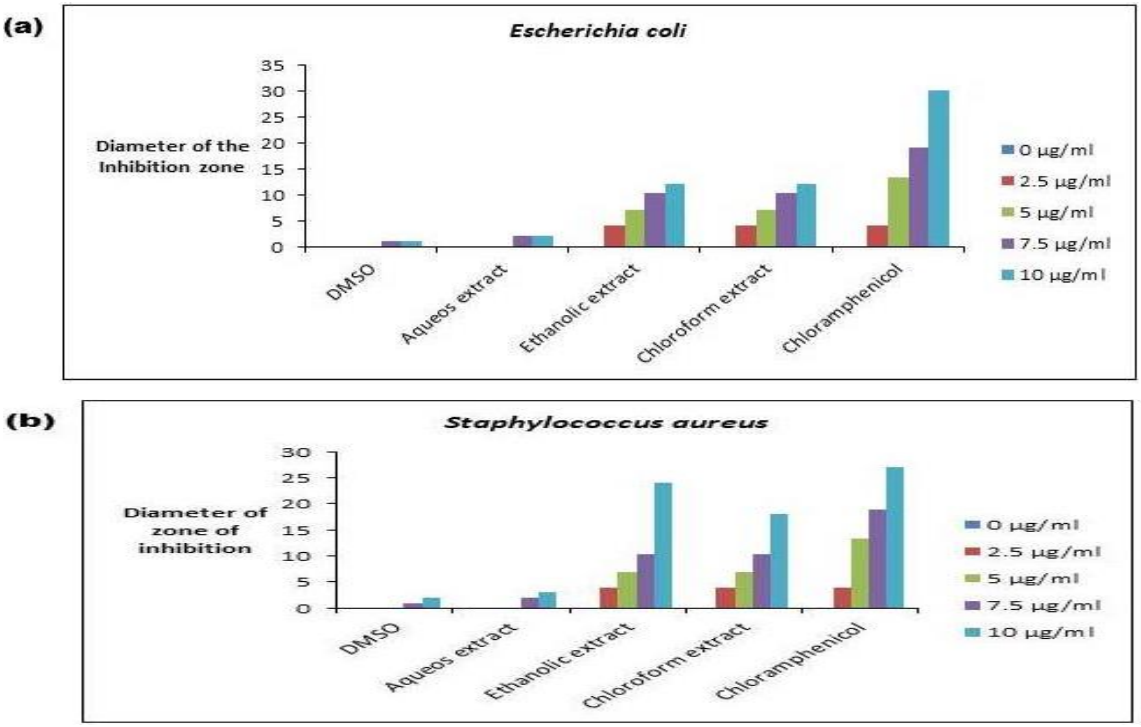

Figure. 5: Graphical representation of the efficacy of various extracts of the flower of Abutilon indicum towards against Escherichia coli & Staphylococcus aureus. The flower extract of the ethanol (10 µg/ml) was found to be highly active against Escherichia coli & Staphylococcus aureus as compared to the Chloroform extract (10 µg/ml) towards the same bacterial species [2] [20] [22] [23] [24] [25]

IV. CONCLUSIONS

Researchers are seeking for novel anti-microbial drugs due to a spike in the number of multi-drug resistant microorganisms. The purpose of this study is to use the agar well test to assess the antibacterial activity of Abutilon indicum flower extract against Staphylococcus aureus and Escherichia coli. The flower extract of the ethanol (10µg/ml) was found to be highly active against Escherichia coli and Staphylococcus aureus as compared to the chloroform extract (10 µg/ml) towards the same bacterial species. The aqueous extract & DMSO had minimal efficacy towards all the two bacterial species studied. The known antibiotic, Chloramphenicol (10 µg/ml) however showed excellent activity against aforementioned bacterial species. The plant is already well known in Ayurveda & as the plant has shown efficacy against 2 bacterial species, there is hope that many more anti-microbial agents would be discovered from this plant in the near future.

REFERENCES

[1] Blair JMA, Webber MA, Baylay AJ, Ogbolu DO, Piddock LJV. Molecular mechanisms of antibiotic resistance. Nature Reviews Microbiology. 2015.
[2] AbuOun M, Stubberfield EJ, Duggett NA, Kirchner M, Dormer L, Nunez-Garcia J, et al. mcr-1 and mcr-2 variant genes identified in Moraxella species isolated from pigs in Great Britain from 2014 to 2015. J Antimicrob Chemother. 2017;
[3] Ravi L, Manasvi V, Praveena Lakshmi B. Antibacterial and antioxidant activity of saponin from Abutilon indicum leaves. Asian J Pharm Clin Res. 2016;
[4] Ramasubramania Raja R, Kailasam KV. Abutilon indicum L (Malvaceae)-medicinal potential review. Pharmacognosy Journal. 2015.
[5] Matreja PS, Kaur J, Yadav L. Acceptability of the use of crossword puzzles as an assessment method in pharmacology. J Adv Med Educ Prof. 2021;
[6] Agarwal A, Raj Singh M, Joon P. Sonourethrography With Pharmaco-Penile Doppler in Penile Fractures: A Complete and Productive Imaging Combination. J Diagnostic Med Sonogr. 2021;
[7] Wright GD. Molecular mechanisms of antibiotic resistance. Chem Commun. 2011;
[8] Tripathi L, Kumar P, Singh R. A Review on Extraction, Synthesis and Anticancer Activity of Betulinic Acid. Curr Bioact Compd. 2009;
[9] Agarwal A, Agarwal S. Morbid Adherent Placenta Score: A Simple and Practical Approach on Application of Placenta Accreta Index. Journal of Ultrasound in Medicine. 2021.
[10] CREST. Guidelines on the management of cellulitis in adults. www.gain-ni.org. 2005.
[11] Alam MK, Alhhazmi A, Decoteau JF, Luo Y, Geyer CR. RecA Inhibitors Potentiate Antibiotic Activity and Block Evolution of Antibiotic Resistance. Cell Chem Biol. 2016;
[12] Ijaz F, Shahid S, Khan SA, Ahmad W, Zaman S. Green synthesis of copper oxide nanoparticles using abutilon indicum leaf extract: Antimicrobial, antioxidant and photocatalytic dye degradation activities. Trop J Pharm Res. 2017;
[13] Ashokkumar S, Ravi S, Kathiravan V, Velmurugan S. Synthesis of silver nanoparticles using A. indicum leaf extract and their antibacterial activity. Spectrochim Acta - Part A Mol Biomol Spectrosc. 2015;
[14] Parashar S, Chawla VK. A systematic review on sustainable green fibre reinforced composite and their analytical models. In: Materials Today: Proceedings. 2020.
[15] Ayhan DH, Tamer YT, Akbar M, Bailey SM, Wong M, Daly SM, et al. Sequence-Specific Targeting of Bacterial

Resistance Genes Increases Antibiotic Efficacy. PLoS Biol. 2016;
[16] Pathak D, Singh RP, Gaur S, Balu V. Experimental investigation of effects of welding current and electrode angle on tensile strength of shielded metal arc welded low carbon steel plates. In: Materials Today: Proceedings. 2019.
[17] Pathak D, Singh RP, Gaur S, Balu V. Influence of groove angle on hardness and reinforcement height of shielded metal arc welded joints for low carbon AISI 1016 steel plates. In: Materials Today: Proceedings. 2020.
[18] Pathak D, Singh RP, Gaur S, Balu V. Influence of input process parameters on weld bead width of shielded metal arc welded joints for AISI 1010 plates. In: Materials Today: Proceedings. 2020.
[19] Gaurav A, Yadav MR, Giridhar R, Gautam V, Singh R. 3D-QSAR studies of 4-quinolone derivatives as high-affinity ligands at the benzodiazepine site of brain GABAA receptors. Med Chem Res. 2011;
[20] Verma KG, Kaushik BK, Singh R. Effects of process variation in VLSI interconnects - A technical review. Microelectron Int. 2009;
[21] Gupta V, Bhatt V, Chandra S. RF magnetron sputtered aluminum oxide films for MEMS. In: Proceedings of the 14th International Workshop on the Physics of Semiconductor Devices, IWPSD. 2007.
[22] Khatri M, Kumar A. Stability Inspection of Isolated Hydro Power Plant with Cuttlefish Algorithm. In: 2020 International Conference on Decision Aid Sciences and Application, DASA 2020. 2020.
[23] Ghai W, Kumar S, Athavale VA. Using gaussian mixtures on triphone acoustic modelling-based punjabi continuous speech recognition. In: Advances in Intelligent Systems and Computing. 2021.
[24] Mahat RK, Panda S, Rathore V, Swain S, Yadav L, Sah SP. The dynamics of inflammatory markers in coronavirus disease-2019 (COVID-19) patients: A systematic review and meta-analysis. Clinical Epidemiology and Global Health. 2021.
[25] Ghai DP, Vyas S, Senthilkumaran P, Sirohi RS. Detection of phase singularity using a lateral shear interferometer. Opt Lasers Eng. 2008;