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MICROWAVE ASSISTED SYNTHESIS AND BIO EFFICACY EVALUATION OF NEW 1,5-BENZODIAZEPINES

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ABSTRACT:-

Benzodiazepine is an important class of pharmacologically eminent organic compounds. Biologically eminent 1,5-benzodiazepines were synthesized in good yields from hydroxypropiophenones and *o*-phenylenediamine by microwave irradiation method. The synthesized compounds were characterized by IR, ^{1}HNMR and Mass spectral data. The synthesized compounds were tested for their bacterial and fungal activity. Some compounds showed excellent antimicrobial properties while remaining compounds showed moderate to good antimicrobial activities.

KEYWORDS:-

1,5-Benzodiazepines, Hydroxypropiophenones, Antimicrobial, Microwave irradiation method.

INTRODUCTION:-

Benzodiazepine is an important class of pharmacologically eminent organic compounds due to therapeutic applications[i]. Considerable interest has been focused on the synthesis of benzodiazepines because of their wide range of biological activities[ii]. In the last decade, the area of biological interest of 1,5-benzodiazepines has been extended to several diseases such as cancer, viral infection and cardiovascular disorders[iii]. 1,5-benzodiazepines are useful precursors for the synthesis of some fused ring benzodiazepine derivatives such as oxadiazolo[iv], oxazino[v] or furanobenzodiazepines[vi]. Beside this, 1,5-benzodiazepines show antimicrobial[vii], anti-neuroinflammatory[viii], anti-anxiety[ix], antiviral[x], antifungal and anthelmintic[xi], analgesic, anti-inflammatory and antipyretic activity[xii].

Microwave assisted conditions provide advantages such as shorter reaction time, enhanced yields of products and eco friendly one[xiii,xiv].

Psychiatrists use benzodiazepines to treat anxiety and sleep disorders, acute agitation, alcohol withdrawal, catatonia, and psychotropic side effects[xv]. Therapeutic values of benzodiazepine turn our intension to prepare 1,5 benzodiazepines from hydroxyl propiophenones and *o*-phenylenediamine by microwave irradiation method and to assess their biological activity.

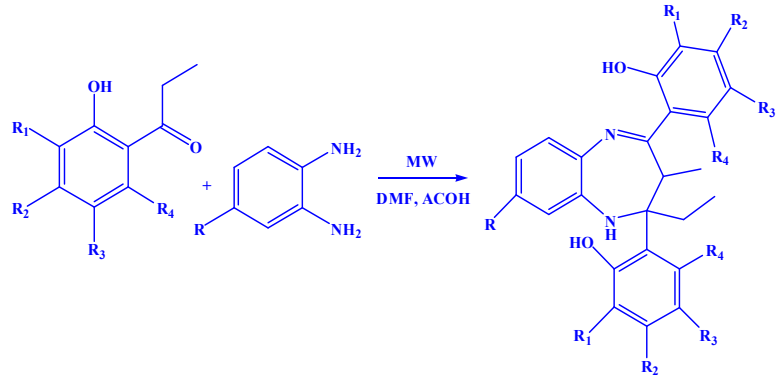
RESULT AND DISCUSSION:-

A pilot experiment was started using 1-(2-hydroxy-phenyl)-propan-1-one and benzene-1,2-diamine by reflux method, the product did not obtain even after 24 hours. It was observed that synthesis of 1,5-benzodiazepines by reflux method was practically time consuming. To decrease the time duration the experiment was carried out using microwave at 500 watt. The reaction completed in 5 minutes. It was observed the time for completion of reaction was reduced remarkably. Generally observed shortcoming that sterically hindered higher ketones react sluggishly during cyclization, leading to poor yields was also overcome by microwave method and reaction takes place more rapidly, safely with high yields.

Encouraged by this outcome and to increase more insight into the reaction a variety of 1,5-benzodiazepines were synthesized from different substituted hydroxypropiophenones (Scheme 1) and get the corresponding 1,5-benzodiazepines in almost quantitative yield. Both analytical and spectroscopic data of all the synthesized compounds are in agreement with the proposed structures.

Assignments of chosen characteristic of IR band positions provided significant sign for the formation of the 1,5-benzodiazepines. Synthesized 1,5-benzodiazepines shows charecterstic band at near region 3300 cm^{-1} due to N-H stretching vibrations and at 1597-1630 cm^{-1} due to C=N stretching confirms formation of 1,5-benzodiazepines, which was supported by the absence of absorption band at 1700-1725 cm^{-1} for C=O. The absorption bands near 1567 cm^{-1} and 1460 cm^{-1} are due to C=C and C-N functions of benzodiazepine moiety respectively. Absorption at 3400-3490 cm^{-1} is due to (2-OH) hydroxyl group. In addition confirmation for the formation of 1,5-benzodiazepines was obtained from the ^{1}H NMR spectra, which provide indicative tools for the positional elucidation of the protons. Singlet for –NH appears at about δ 3.50-5.00. Doublet appears for CH-$\underline{CH_3}$ at δ 1.45-1.65 and for $\underline{CH}$-CH_3 appears as quartet at δ 2.72-2.85 (J = 6.8 Hz). Triplet appeared at δ 1.20-1.25 for -CH_2-$\underline{CH_3}$ (J = 7.2 Hz) and quartet at δ 2.80-3.15 for -$\underline{CH_2}$-CH_3 (J = 7.2 Hz) is observed in all compounds. Another common signal appearing as singlet at δ 12.25-15 is due to –OH group. The mass spectra of the synthesized compounds show the molecular ion peak confirming the molecular weight of the compounds.

All synthesized compounds were screened for antibacterial activity against *E. coli, P. auregenosa, S. Aureus* and *B. subtilis* as well as antifungal activity against *A. niger, P. chrysogenum, F. moneliforme* and *A. flavus*. It is observed that some of them have good antifungal activity, and many of them have potent antibacterial activity. The results confirm that the compounds containing chloro and iodo groups showed potent antibacterial and antifungal activities.



1 **2** **3 a-n**

Scheme 1:- Synthesis of 1,5-benzodiazepines from substituted hydroxypropiophenones

Entry	R_1	R_2	R_3	R_4	R
3a	H	H	H	H	H
3b	H	H	H	H	CH_3
3c	H	H	Cl	H	H
3d	H	H	Cl	H	Cl
3e	H	H	CH_3	H	H
3f	H	H	CH_3	H	CH_3
3g	I	H	CH_3	H	H
3h	I	H	Cl	H	H
3i	I	H	CH_3	H	CH_3
3j	I	H	Cl	H	CH_3
3k	I	H	CH_3	H	Cl
3l	I	H	Cl	H	Cl
3m	I	H	CH_3	H	NO_2
3n	I	H	Cl	H	NO_2

2,4-bis(2-hydroxyphenyl)-2-ethyl-3-methyl-2,3-dihydro-1H-1,5-benzodiazepine(3a):- Yield–73%, M.P.- 160°C; **IR(KBr)cm^{-1}:** 3410(OH), 3313(NH), 1620(C=N), 1480(C=C); **^{1}HNMR (300MHz, $CDCl_3$), δ, ppm (J, Hz)** :- δ 1.21 (3H, t, J = 7.2, CH_3), 2.85 (2H, q, J = 7.2, CH_2), 1.45 (3H, d, CH_3), 2.72 (1H, q, J = 6.8, CH), 3.50 (1H, s, NH), 6.50-7.40 (m,12H, Ar-H), 13.23 (1H, s,-OH); **M.S.-** *m/z* -372 $M^{+\cdot}$, **Anal. Calcd for** $C_{24}H_{24}N_2O_2$; C, 77.39; H, 6.49; N, 7.52; Found: C, 77.08; H, 6.07; N, 7.94.

2,4-bis(2-hydroxyphenyl)-2-ethyl-3,7-dimethyl-2,3-dihydro-1H-1,5-benzodiazepine(3b):- Yield–73%, M.P.- 105°C; **IR (KBr) cm^{-1}:** 3422(OH), 3310(NH), 1600(C=N), 1530(C=C); **^{1}HNMR (300MHz, $CDCl_3$), δ, ppm (J, Hz)** :- δ 1.20 (3H, t, J = 7.2, CH_3), 2.80 (2H, q, J = 7.2, CH_2), 1.47 (3H, d, CH_3), 2.75 (1H, q, J = 6.8, CH), 3.65 (1H, s, NH), 2.30 (3H, s, Ar-CH_3), 6.50-7.45 (m,11H, Ar-H), 14.00 (1H, s,-OH); **M.S.-** *m/z* -386 $M^{+\cdot}$, **Anal. Calcd for** $C_{25}H_{26}N_2O_2$; C, 77.69; H, 6.78; N, 7.25, Found: C, 77.14; H, 6.09; N, 6.90.

2,4-bis(5-chloro-2-hydroxyphenyl)-2-ethyl-3-methyl-2,3-dihydro-1H-1,5-benzodiazepine (3c) Yield–70%, M.P.- 158°C; **IR(KBr) cm^{-1}:** 3419(OH), 3333(NH), 1613(C=N), 1474(C=C) ; **^{1}HNMR (300MHz, $CDCl_3$), δ, ppm (J, Hz)** :- δ 1.25 (3H, t, J = 7.2, CH_3), 3.00 (2H, q, J = 7.2, CH_2), 1.53 (3H, d, CH_3), 2.77 (1H, q, J = 6.8, CH), 3.60 (1H,

s, NH), 6.95-7.75 (m, 10H, Ar-H), 12.28 (1H, s,-OH); **M.S.-***m/z* -440 $M^{+\cdot}$, **Anal. Calcd for** $C_{24}H_{22}Cl_2N_2O_2$; C, 65.31; H, 5.02; Cl, 16.07; N, 6.35, Found: C, 65.01; H, 5.72; Cl, 16.45, N, 6.84.

2,4-bis((5-chloro-2-hydroxyphenyl)-7-chloro-2-ethyl-3-methyl-2,3-dihydro-1H-1,5-benzodiazepine (3d):- Yield–70%, M.P.-165^{o}C; **IR(KBr)cm^{-1}:** 3480(OH), 3350(NH), 1630(C=N), 1592(C=C); **^{1}HNMR (300MHz, $CDCl_3$), δ, ppm (J, Hz)** :- δ 1.25 (3H, t, J = 7.2, CH_3), 3.00 (2H, q, J = 7.2, CH_2), 1.53 (3H, d, CH_3), 2.79 (1H, q, J = 6.8, CH), 3.95 (1H, s, NH), 6.80-7.90 (m,9H, Ar-H), 13.50 (1H, s,-OH); **M.S.-** *m/z* -474 $M^{+\cdot}$, **Anal. Calcd for** $C_{24}H_{21}Cl_3N_2O_2$; C, 60.58; H, 4.45; Cl, 22.35; N, 5.89, Found,C, 60.09; H, 4.98; Cl, 22.89, N, 5.11.

2,4-bis(2-hydroxy-5-methylphenyl)-2-ethyl-3-methyl-2,3-dihydro-1H-1,5-benzodiazepine(3e):- Yield–71%, M.P.- 145^{o}C; **IR (KBr) cm^{-1}:** 3400(OH), 3275(NH), 1597(C=N), 1474(C=C) ; **^{1}HNMR (300MHz, $CDCl_3$), δ, ppm (J, Hz)** :- δ 1.20 (3H, t, J = 7.2, CH_3), 2.83 (2H, q, J = 7.2, CH_2), 1.49 (3H, d, CH_3), 2.73 (1H, q, J = 6.8, CH), 3.67 (1H, s, NH), 2.37 (6H, s, Ar-CH_3), 6.73-7.63 (m,10H, Ar-H), 12.25 (1H, s,-OH); **M.S.-** *m/z* -401 $M^{+\cdot}$, **Anal. Calcd for** $C_{26}H_{28}N_2O_2$; C, 77.97; H, 7.05; N, 6.99, Found C, 77.38; H, 6.81; N, 6.25.

2,4-bis(2-hydroxy-5-methylphenyl)-2-ethyl-3,7-dimethyl-2,3-dihydro-1H-1,5-benzodiazepine(3f):- Yield–74%, M.P.- 155^{o}C; **IR (KBr) cm^{-1}:** 3451(OH), 3358(NH), 1597(C=N), 1567(C=C) ; **^{1}HNMR (300MHz, $CDCl_3$), δ, ppm (J, Hz)** :- δ 1.25 (3H, t, J = 7.2, CH_3), 3.05 (2H, q, J = 7.2, CH_2), 1.65 (3H, d, CH_3), 2.75 (1H, q, J = 6.8, CH), 3.80 (1H, s, NH), 2.30 (9H, s, Ar-CH_3), 6.95-7.75 (m, 9H, Ar-H), 12.25 (1H, s,-OH); **M.S.-** *m/z* -415 $M^{+\cdot}$, **Anal. Calcd for** $C_{27}H_{30}N_2O_2$; C, 78.23; H, 7.29; N, 6.76, Found, C, 78.91; H, 7.89; N, 6.05.

2,4-bis(2-hydroxy-3-iodo-5-methylphenyl)-2-ethyl-3-methyl-2,3-dihydro-1H-1,5-benzodiazepine (3g):- Yield–68%, M.P.- 130^{o}C; **IR (KBr) cm^{-1}:** 3444(OH), 3292(NH), 1599(C=N), 1525(C=C); **^{1}HNMR (300MHz, $CDCl_3$), δ, ppm (J, Hz)** :- δ 1.22 (3H, t, J = 7.2, CH_3), 2.83 (2H, q, J = 7.2, CH_2), 1.58 (3H, d, CH_3), 2.75 (1H, q, J = 6.8, CH), 3.73 (1H, s, NH), 2.40 (6H, s, Ar-CH_3), 6.60-7.65 (m, 8H, Ar-H), 12.45 (1H, s, -OH); **M.S.-** *m/z* -652 $M^{+\cdot}$, **Anal. Calcd for** $C_{26}H_{26}I_2N_2O_2$; C, 47.87; H, 4.02; I, 38.91; N, 4.29, Found: C, 47.00; H, 4.77; I, 38.30, N, 4.92.

2,4-bis(5-chloro-2-hydroxy-3-iodophenyl)-2-ethyl-3-methyl-2,3-dihydro-1H-1,5-benzodiazepine (3h):- Yield–68%, M.P.- 95^{o}C; **IR (KBr) cm^{-1} :** 3430(OH), 3305(NH), 1602(C=N), 1518(C=C) ; **^{1}HNMR (300MHz, $CDCl_3$), δ, ppm (J, Hz)** :- δ 1.24 (3H, t, J = 7.2, CH_3), 3.05 (2H, q, J = 7.2, CH_2), 1.61 (3H, d, CH_3), 2.79 (1H, q, J = 6.8, CH), 3.50 (1H, s, NH), 6.50-7.69 (m, 8H, Ar-H), 13.40 (1H, s, -OH); **M.S.-** *m/z* -692 $M^{+\cdot}$, **Anal. Calcd for** $C_{24}H_{20}Cl_2I_2N_2O_2$; C, 41.59; H, 2.91; Cl, 10.23; I, 36.62; N, 4.04, Found, C, 41.21; H, 2.17; Cl, 10.67, I, 36.04, N, 4.84.

2,4-bis(2-hydroxy-3-iodo-5-methylphenyl)-2-ethyl-3,7-dimethyl-2,3-dihydro-1H-1,5-benzodiazepine (3i) Yield–70%, M.P.- 75^{o}C; **IR (KBr) cm^{-1} :** 3417(OH), 3327(NH), 1613(C=N), 1485(C=C) ; **^{1}HNMR (300MHz, $CDCl_3$), δ, ppm (J, Hz)** :- δ 1.20 (3H, t, J = 7.2, CH_3), 2.88 (2H, q, J = 7.2, CH_2), 1.59 (3H, d, CH_3), 2.78 (1H, q, J = 6.8, CH), 3.70 (1H, s, NH), 2.25 (3H, s, Ar-CH_3), 2.40 (6H, s, Ar-CH_3), 6.60-7.70 (m, 7H, Ar-H), 12.90 (1H, s,-

OH); **M.S.-** *m/z* -666 $M^{+\cdot}$, **Anal. Calcd for** $C_{27}H_{28}I_2N_2O_2$; C, 48.67; H, 4.24; I, 38.09; N, 4.20, Found: C, 48.10; H, 4.88; I, 38.74, N, 4.75.

2,4-bis(5-chloro-2-hydroxy-3-iodophenyl)-2-ethyl-3,7-dimethyl-2,3-dihydro-1H-1,5-benzodiazepine (3j):- Yield–68%, M.P.- 110°C; **IR(KBr)cm^{-1}:** 3485(OH), 3380(NH), 1630(C=N), 1592(C=C); **^{1}HNMR (300MHz, $CDCl_3$), δ, ppm (J, Hz)** :- δ 1.23 (3H, t, J = 7.2, CH_3), 3.10 (2H, q, J = 7.2, CH_2), 1.60 (3H, d, CH_3), 2.80 (1H, q, J = 6.8, CH), 4.50 (1H, s, NH), 2.33 (3H, s, Ar-CH_3), 6.65-7.80 (m, 7H, Ar-H), 14.02 (1H, s,-OH); **M.S.-** *m/z* -707 $M^{+\cdot}$, **Anal. Calcd for** $C_{25}H_{22}Cl_2I_2N_2O_2$; C, 42.46; H, 3.14; Cl, 10.03; I, 35.89; N, 3.96, Found: C, 42.11; H, 3.94; Cl, 10.62; I, 35.23; N, 4.15.

2,4-bis(2-hydroxy-3-iodo-5-methylphenyl)-7-chloro-2-ethyl-3-methyl-2,3-dihydro-1H-1,5-benzodiazepine (3k):- Yield–71%, M.P.- 95°C; **IR (KBr) cm^{-1}:** 3475(OH), 3295(NH), 1618(C=N), 1513(C=C) ; **^{1}HNMR (300MHz, $CDCl_3$), δ, ppm (J, Hz)** :- δ 1.25 (3H, t, J = 7.2, CH_3), 2.95 (2H, q, J = 7.2, CH_2), 1.58 (3H, d, CH_3), 2.78 (1H, q, J = 6.8, CH), 3.97 (1H, s, NH), 2.42 (6H, s, Ar-CH_3), 6.50-7.60 (m, 7H, Ar-H), 12.88 (1H, s,-OH); **M.S.-** *m/z* -687 $M^{+\cdot}$, **Anal. Calcd for** $C_{26}H_{25}ClI_2N_2O_2$; C, 45.47; H, 3.67; Cl, 5.16; I, 36.96; N, 4.08, Found C, 45.85; H, 3.26; Cl, 5.69; I, 36.10; N, 4.73.

2,4-bis(5-chloro-2-hydroxy-3-iodophenyl)-7-chloro-2-ethyl-3-methyl-2,3-dihydro-1H-1,5-benzodiazepine (3l):- Yield–68%, M.P.- 120°C; **IR (KBr) cm^{-1}:** 3490(OH), 3345(NH), 1622(C=N), 1581(C=C); **^{1}HNMR (300MHz, $CDCl_3$), δ, ppm (J, Hz)**:- δ 1.25 (3H, t, J = 7.2, CH_3), 3.15 (2H, q, J = 7.2, CH_2), 1.65 (3H, d, CH_3), 2.85 (1H, q, J = 6.8, CH), 5.00 (1H, s, NH), 6.80-7.90 (m, 7H, Ar-H), 15.00 (1H, s,-OH); **M.S.-** *m/z* -728 $M^{+\cdot}$, **Anal. Calcd for** $C_{24}H_{19}Cl_3I_2N_2O_2$; C, 39.62; H, 2.63; Cl, 14.62; I, 34.88; N, 3.85, Found, C, 39.44; H, 2.90; Cl, 14.23; I, 34.21; N, 3.41.

2,4-bis(2-hydroxy-3-iodo-5-methylphenyl)-2-ethyl-3-methyl-7-nitro-2,3-dihydro-1H-1,5-benzodiazepine (3m):- Yield–70%, M.P.-125°C; **IR(KBr)cm^{-1}:** 3460(OH), 3367(NH), 1611(C=N), 1535(C=C) ; **^{1}HNMR (300MHz, $CDCl_3$), δ, ppm (J, Hz)** :- δ 1.23 (3H, t, J = 7.2, CH_3), 2.92 (2H, q, J = 7.2, CH_2), 1.63 (3H, d, CH_3), 2.83 (1H, q, J = 6.8, CH), 4.77 (1H, s, NH), 2.41 (6H, s, Ar-CH_3), 6.50-7.50 (m, 7H, Ar-H), 12.85 (1H, s,-OH); **M.S.-** *m/z* -697 $M^{+\cdot}$, **Anal. Calcd for** $C_{26}H_{25}I_2N_3O_4$; C, 44.78; H, 3.61; I, 36.40; N, 6.03, Found C, 44.31; H, 3.23; I, 36.92; N, 6.81.

2,4-bis(5-chloro-2-hydroxy-3-iodophenyl)-2-ethyl-3-methyl-7-nitro-2,3-dihydro-1H-1,5-benzodiazepine (3n):- Yield–71%, M.P.-110°C; **IR(KBr)cm^{-1}:** 3478(OH), 3355(NH), 1626(C=N), 1499(C=C) ; **^{1}HNMR 300MHz, $CDCl_3$), δ, ppm (J, Hz)** :- δ 1.22 (3H, t, J = 7.2, CH_3), 2.95 (2H, q, J = 7.2, CH_2), 1.64 (3H, d, CH_3), 2.84 (1H, q, J = 6.8, CH), 3.80 (1H, s, NH), 6.50-7.70 (m, 7H, Ar-H), 13.83 (1H, s,-OH); **M.S.-** *m/z* -738 $M^{+\cdot}$, **Anal. Calcd for** $C_{24}H_{19}Cl_2I_2N_3O_4$; C, 39.05; H, 2.59; Cl, 9.61; I, 34.38; N, 5.69, Found C, 39.81; H, 2.08; Cl, 9.10; I, 34.98; N, 5.26.

BIOLOGICAL ACTIVITY:-

Synthesized compounds were tested for their antibacterial activity *in vitro* against bacterial strains such as *E. coli*, *P. aeruginosa, S. aureus* and *B. subtillis* employing the agar cup method[xvi]. The antifungal activity was evaluated by poison plate method[xvii]. Nutrient agar was used as culture for antibacterial activity and potato dextrose agar was used as culture for antifungal activity and DMSO was used to dissolve compounds. The results of the antibacterial and antifungal activity are shown in Table 1.

Table 1: Antimicrobial activity of 1,5-benzodiazepines

Sr. No.	Comp.	Antibacterial activity Zone of Inhibition (mm)				Antifungal activity			
		S. aureus	*B. subtilis*	*E. coli*	*P. auregenosa*	*A. niger*	*P. chrysogenum*	*F. moneliforme*	*A. flavus*
1	3a	08	02	02	08	RG	+ve	+ve	+ve
2	3b	08	04	02	08	RG	+ve	RG	+ve
3	3c	10	10	02	10	+ve	RG	+ve	RG
4	3d	15	11	02	14	-ve	RG	+ve	RG
5	3e	13	10	00	08	+ve	RG	RG	+ve
6	3f	13	14	00	10	RG	+ve	+ve	RG
7	3g	00	13	00	14	-ve	+ve	+ve	+ve
8	3h	20	21	02	21	-ve	RG	+ve	+ve
9	3i	13	11	00	10	-ve	-ve	+ve	+ve
10	3j	15	14	00	15	-ve	-ve	RG	RG
11	3k	17	13	00	14	-ve	-ve	RG	RG
12	3l	23	20	02	18	-ve	RG	RG	RG
13	3m	20	15	02	18	-ve	RG	+ve	+ve
14	3n	30	24	04	22	-ve	-ve	RG	+ve
Std.	Penicillin	30	19	14	33	---	---	---	---
	Griseofulvin	---	---	---	---	-ve	-ve	-ve	-ve

+ve – Growth (Antifungal activity absent)
-ve – No Growth (Antifungal activity present)
RG – Reduced Growth (More than 50% reduction in growth)

EXPERIMENTAL:-

Melting points were determined in an open capillary tube and are uncorrected. IR spectra were recorded in KBr on a FTIR perkin-Elmer spectrometer. ^{1}HNMR spectra were recorded on Avance 300 MHz spectrometer in $CDCl_3$ solvent. Mass spectra were taken on Agilent 5973 N GC-MS.

GENERAL PROCEDURE FOR SYNTHESIS OF 1,5-BENZODIAZEPINES:-

An equimolar mixture of substituted 2-hydroxy propiophenones and *o*-phenylene diamine in DMF is irradiated for appropriate time in Q-pro M modified microwave system at power level 500W for 3min. then glacial acetic acid 3 ml is added to the reaction mixture and again irradiated for 2 min. Progress of the reaction is monitored by TLC. The reaction mixture is cooled to room tempreture. Resultant solid obtained is filtered, dried and recrystalized by ethanol to obtain pure crystals of desired compounds (3a-n)

CONCLUSION:-

New 1,5-benzodiazepines were synthesized from substituted hydroxypropiophenones using microwave accelerated conditions which provides advantages such as shorter reaction time, enhanced yields of products and eco friendly one. All synthesized compounds were screened for antibacterial activity against *E. coli, P. auregenosa, S. Aureus* and *B. subtilis* as well as antifungal activity against *A.niger, P. chrysogenum, F. moneliforme* and *A. flavus.* It is observed that compound 3n and 3l are having significant antibacterial activity. The compounds 3h, 3m showed good antibacterial activity and compounds 3j, 3k have significant antifungal activities while compounds 3l, 3n have good antifungal activities. Remaining compounds showed moderate properties. It can be observed that chloro and iodo substituent in the structures are responsible for significant antibacterial and antifungal activity.

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REFERENCES:-

i. L. H. Strenbach, *J Med Chem.,* **22**, 1, (1979).
ii. J. K. Landquist, Comprehensive Heterocyclic Chemistry, Kalritzky, A. R. Rees, C. W.; Eds.; Peramon: Oxford, **1**, 166, (1984).
iii. V. Merluzzi, K. D. Hargrave, M. Labadia, K. Grozinger, M. Skoog, J. C. Wu, C. K. Shih, C. K. Eckner, S. Hattox, J. Adams, A. S. Rosenthal, R. Faanes, R. J. Eckner, R. A. Koup, J. L. Sullivan, *Science,* **250**, 1411-1413, (1990).
iv. A. Chimirri, S. Grass, R. Ottana, G. Romeo, M. Zappala, *J. Heterocycl. Chem*., **27**, 371, (1990).
v. A. M. El-Sayed, H. Abdel-Ghany, A.M.M. El-Saghier, *Synth. Commun.*, **29**, 3561, (1999).
vi. K.V.V. Reddy, P.S. Rao, D. Ashok, *Synth. Commun*., **30,** 1825, (2000).
vii S.Shaikh and M. A. Baseer, *Int. J. of Pharma. Sci. and Res*., **4(7),** 2717-2720, (2013).
viii. S. K. Ha, D. Shobha, E. Moon, M. A. Chari, K. Mukkanti, S. H. Kim, K. H. Ahn, S. Y. Kim, *Bioorganic & Medicinal Chemistry Letters,* **20**, 3969–3971, (2010).
ix. R. A. Kusanur, M. Ghate, M. V. Kulkarni, *J.Chem. Sci.*, **116(5)**, 265-270, (2004).
x. B. D. Puodziunaite, R. Janciene, L. Kosychova, Z. Stumbreviciute, *Arkivoc **(iv)***, 512-522, (2000).
xi. R. Kumar, and Y. C. Joshi, *J. Serb. Chem. Soc*, **73(10),** 937-943, (2008).
xii. G. Grossi, M. D. Braccio, G. Roma, V. Ballabeni, M. Tognolini, F. Calcina, E. Barocelli, *Eur. J. Med. Chem*, **37**, 933-944, (2002).
xiii. P. Lidstrom, J. Tierney, B. Wathey, J. Westman, *Tetrahedron,* **57**, 9225–9283, (2001).
xiv. B. L. Hayes, Microwave Synthesis: Chemistry at the Speed of Light, CEM Publishing, Matthews, NC, (2002).
xv. J. R. Bostwick, M. I. Casher, S. Yasugi, *Current Psychiatry*, **11(4),** 55, (2012).

xvi. C. H. Collins, Microbiological Methods (Butterworth, London), 364, (1967).
xvii. R. J. Cruickshank, P. Duguid, R. R. Swain, (1998), Medical Microbiology, Vol.-I, publisher Churchill Livingstone

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