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Go Green with Flavones: Eco-friendly Microwave Assisted Synthesis of some Substituted Flavones

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Abstract

An ecofriendly, economic, easy and greener chemical pathway used to prepare pharmaceutically important substituted flavones on oxidative cyclization of substituted chalcones by microwave irradiation in DMSO/I_2 media. Microwave synthesis offers advantages over conventional heating by time, extent of chemicals used and by yield. Flavones synthesized are analyzed by spectra.

Keywords: Microwave, Chalcones, Flavones, spectral analysis.

Introduction

The flavones, as is well known, form a group of naturally-occuring chemical compounds widely distributed in the plant world.Flavones belongs to flavonoids family. Flavonoids are agroup of low molecular weight compounds. Flavonoids are widely distributed among higher plants. They constitute most of yellow colour in flowers and fruits. In Latin flavus means yellow colour. The interaction of dietary flavonoids shows great medicinal value[1], even if act as chemo preventive agents against the development of cancer[2]. The pharmaceutical effects[3] including different disorders like viral infection, carcinogenic activity, so flavones acting as anti cancer agent, anti viral[4] agent also anti oxidant[5].

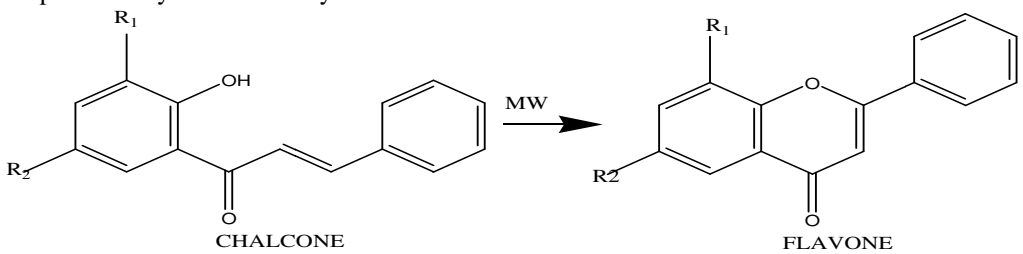
The industries always in need to prepare ecofrendly compounds in cleaner sense and microwave are the great option for it[6]. Recently, there is a surge to employ microwave in organic synthesis. Microwave synthesis offers advantages over conventional heating due to rapid heating and increased rate of reaction. Also, cleaner reactions together with improvement in yield and selectivity are mostly observed. This microwave synthesis really acting as ecofriendly as it reduces reaction time, wastage and improve productivity in cleaner way[7].

Generally, flavones are synthesized by various methods like Auwer's method[8], Witting reaction[9]. The ring substitution on flavones decides its biological activity[10], solute-solvent interactions[11], electron donating-accepting nature.

Variously substituted chalcones were condensed with I_2/DMSO to afford the desired flavones 85-90% yield under microwave irradiation[12]. This reaction was completed within 5 min.

Methodology

The melting points reported are uncorrected and were taken in open capillaries, characterized by IR, NMR spectra. The reaction was carried out in domestic microwave oven. The chalcone (1mmole) was suspended in (DMSO, 2ml) and to this solution Iodine (0.02mmole) was added. The mixture was subjected to microwave irradiations for 2 minutes at level 5. The mixture was diluted with water excess and extracted with diethyl ether.The organic layer was washed with aq. 20% sodium thiosulphate, water and dried over anhydrous sodium sulphate. The crude solid obtained was subjected to column chromatography over silica gel using hexanes, recrystallized by ethyl alcohol, to get 85-90% yield.



Where: R_1 = -H,-NO_2 ,-Br, R_2 = -CH_3 ,-Cl

Scheme-1
Preparation of Flavone

Table-1
Physical data of Flavones

Compound	M.P. (^{0}C)	Reaction time (conv) in min	Reaction time (microwave) in min.	% yield (conv)	%yield (microwave)
6-methyl flavones	124	30-40	2	70	90
6-methyl-8-nitro flavones	141	35-45	3	72	87
6-methyl-8-bromo flavones	133	30-40	2	68	82
6-chloro flavones	172	30-40	2	75	92
6-chloro-8-nitro flavones	180	35-45	3	70	88
6-chloro-8-bromo flavones	174	30-40	3	70	86

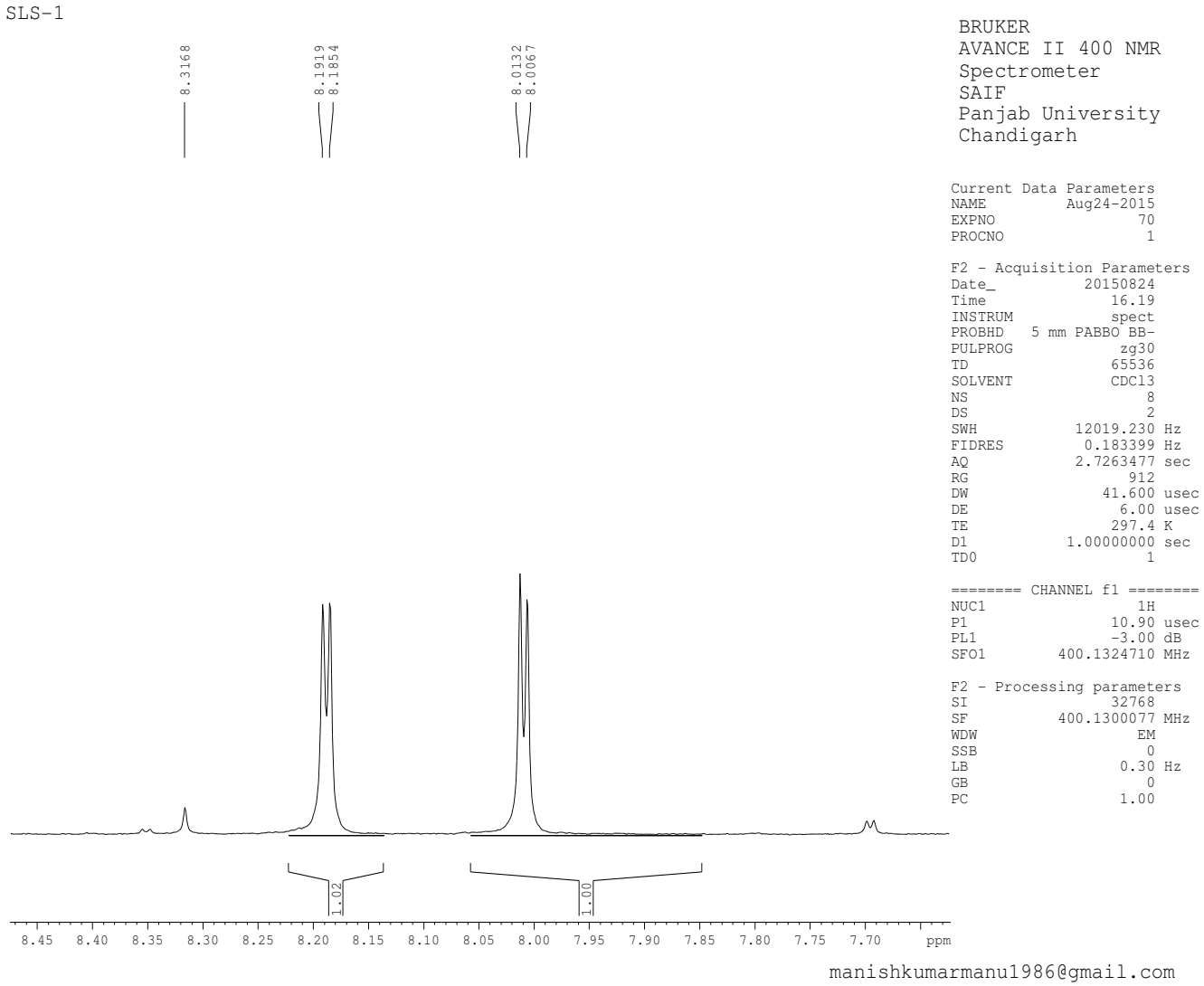


Figure-1
NMR Spectra-6 chloro flavones

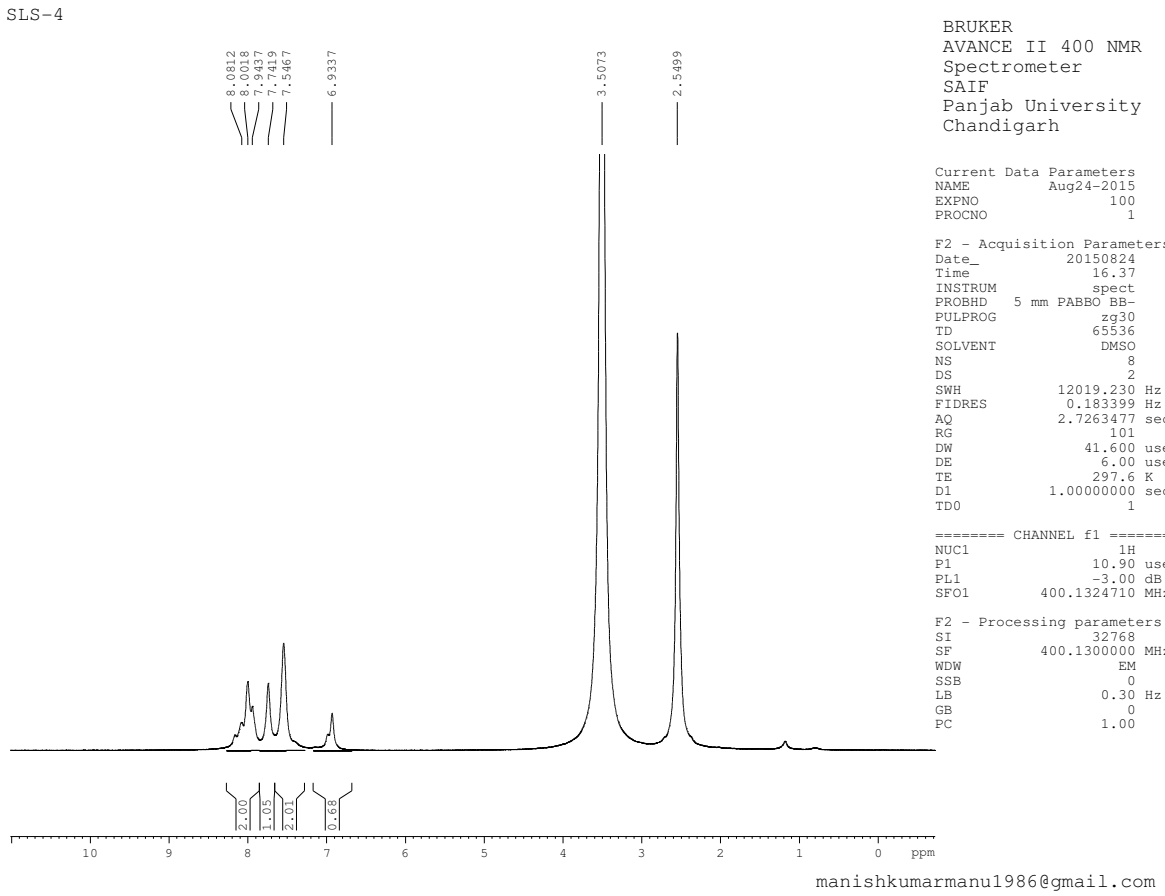


Figure-2
NMR Spectra 6 methyl flavone

Results and Discussion

Spectral data of parent compounds: i. 6-Chloroflavone (SLS4) 6.85 (s,1H), 7.56 (m,4H), 7.66 (dd, 1H, J=2.5,8.8Hz), 7.92 (m,2H), 8.2 (d,1H,J=2.6Hz) ii. 6-Methylflavone (SLS1), 2.46 (s,3H), 6.83 (s,1H), 7.48 (m,5H), 7.93 (m,2H), 8.04 (s,1H).

In the present investigation some new substituted flavones were successfully synthesized using microwave method. Flavones were synthesized from substituted chalcone in I_2/DMSO media. By conventional method this reaction requires about 2-3 htrs whereas in microwave method they have been synthesized within 5-7 minutes with appropriate power setting and time setting. Thus, microwave synthesis of flavones are found to be undoubtedly more economic, efficient, eco-friendly and convenient than other reported methods.

Conclusion

With reference to Table-1, Figure-1,2 the following novel compounds of substituted flavones prepared by cleaner way which reduces chemical wastage, time consumption, more yield productivity. The spectral data shows the substituent on flavones ring which describes its medicinal value also.

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