

**PENGARUH EFEK STERIK DAN INDUKSI PADA BENZALDEHIDA
TERHADAP SINTESIS SENYAWA TURUNAN POLIHIDROKUINOLIN
MELALUI REAKSI MULTIKOMPONEN HANTZSCH TERKATALISIS
 $\text{Fe}_3\text{O}_4\text{-Cu}$ DENGAN METODE SONOKIMIA**

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INTISARI

Telah dilakukan sintesis turunan polihidrokuinolin melalui reaksi multikomponen Hantzsch terkatalisis $\text{Fe}_3\text{O}_4\text{-Cu}$ 10% dengan metode sonokimia. Tujuan dilakukannya penelitian ini yaitu untuk mempelajari pengaruh metode sintesis dan efek sterik serta induksi dari benzaldehida terhadap sintesis turunan polihidrokuinolin.

Pengaruh metode sintesis (pemanasan dan sonikasi), pengaruh efek sterik dan induksi terhadap sintesis turunan polihidrokuinolin dipelajari dengan membandingkan persen hasil dari variasi substituen pada benzaldehida. Benzaldehida digunakan untuk mengevaluasi efisiensi dari metode sintesis. Efek sterik dilakukan pada variasi 4-metilbenzaldehida, 3-metilbenzaldehida dan 2-metilbenzaldehida. Efek induksi dilakukan pada variasi 4-klorobenzaldehida, 4-bromobenzaldehida dan 4-metoksibenzaldehida. Produk yang diperoleh selanjutnya dikarakterisasi dengan spektrometer $^1\text{H-NMR}$, $^{13}\text{C-NMR}$, FTIR, dan CHNS *Elemental Analyzer*.

Pada sintesis turunan polihidrokuinolin dari benzaldehida menggunakan metode pemanasan (3 jam) dan sonikasi (1,5 jam), didapatkan turunan polihidrokuinolin dengan persen hasil berturut-turut sebesar 69% dan 79%. Sintesis turunan polihidrokuinolin dengan variasi 4-metilbenzaldehida, 3-metilbenzaldehida, dan 2-metilbenzaldehida menghasilkan produk dengan persen hasil berturut-turut sebesar 79%, 76% dan 74%. Sintesis turunan polihidrokuinolin dengan variasi 4-klorobenzaldehida, 4-bromobenzaldehida, dan 4-metoksibenzaldehida menghasilkan produk dengan persen hasil berturut-turut sebesar 73%, 75% dan 90%. Hasil penelitian menunjukkan bahwa metode sonikasi lebih efisien daripada metode pemanasan. Selain itu, benzaldehida dengan halangan sterik yang lebih rendah dan yang tersubstitusi dengan gugus yang nilai elektronegativitas lebih tinggi menghasilkan turunan polihidrokuinolin dengan persen hasil yang lebih tinggi.

Kata kunci: $\text{Fe}_3\text{O}_4\text{-Cu}$, efek induksi, efek sterik, polihidrokuinolin, sonokimia

EVALUATION OF STERIC AND INDUCTION EFFECTS OF BENZALDEHYDES $\text{Fe}_3\text{O}_4\text{-Cu}$ -CATALYZED-HANTZSCH MULTICOMPONENT REACTION USING SONICATION METHOD

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ABSTRACT

Synthesis of polyhydroquinoline derivatives has been carried out through $\text{Fe}_3\text{O}_4\text{-Cu}$ 10%-catalyzed-Hantzsch multicomponent reaction using sonochemical method. The purposes of this study were to study the effect of the synthetic method and the steric hindrance as well as the induction of benzaldehydes on the synthesis of polyhydroquinolines.

The evaluation of synthetic method (conventional heating and sonochemical methods), steric and induced effects was studied by comparing the yield of the polyhydroquinolines. Benzaldehyde was used to investigate the efficiency of the synthetic methods. The study of steric effect was carried out by using of 4-methylbenzaldehyde, 3-methylbenzaldehyde, and 2-methylbenzaldehyde. The evaluation of induction effect was performed by utilizing the starting materials of 4-chlorobenzaldehyde, 4-bromobenzaldehyde, and 4-methoxybenzaldehyde. The products obtained were then characterized using $^1\text{H-NMR}$, $^{13}\text{C-NMR}$, FTIR spectrometers and CHNS Elemental Analyzer.

Polyhydroquinoline derivatives was obtained from benzaldehyde in 69% and 79% yields through conventional heating (in 3h) and sonication (in 1.5h) methods, respectively. Synthesis of polyhydroquinolines from 4-methylbenzaldehyde, 3-methylbenzaldehyde and 2-methylbenzaldehyde produced the desired products in 79%, 76% and 74% yields, respectively. Synthesis of polyhydroquinoline derivatives from 4-chlorobenzaldehyde, 4-bromobenzaldehyde and 4-methoxybenzaldehyde produced the corresponding products in 73%, 75% and 90% yields, respectively. The results showed sonication method was more efficient than the conventional heating. In addition, benzaldehydes with lower steric hindrance and substituted with groups with higher electronegativity values produced polyhydroquinoline derivatives with higher percentage yields.

Key words: $\text{Fe}_3\text{O}_4\text{-Cu}$, induction, polyhydroquinoline, sonochemistry, steric