International Journal of Advanced Research and Development
ISSN: 2455-4030
Impact Factor: RJIF 5.24
www.advancedjournal.com
Volume 3; Issue 5; September 2018; Page No. 79-80

Novel applications of bhavanol isolated from roots of Bhallataka for chemical industries

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Abstract
Semecarpus anacardium L.f. (Bhallataka) which grows naturally without any cost and care by the time, is analyzed and investigated as new applications for "Bhavanol'' in the polymer field. *Semecarpus anacardium* oil (Bhavanol) is a valuable agro-byproduct and renewable resource which consists mainly of substituted phenols. Renewable natural resources that can be serving as alternative feed stocks for the chemical industry. In this respect Bhavanol (*Semecarpus anacardium* nut oil) which is isolated from root bark extracts is an abundant agricultural by product, holds considerable promise as a source of unsaturated phenol, an excellent monomer for polymer and chemical industries.

Keywords: *Semecarpus anacardium* L.f., bhavanol isolated, chemical industries

1. Introduction

In recent years, the sustainability is becoming increasingly important for the chemical industry; thus, the use of renewable resources has gained interest in polymer applications. Vegetable oils are extracted primarily from the seeds of oilseed plants [1]. Their competitive cost, worldwide availability, and built-in functionality (ester functions and un-saturations) make them attractive. The development of oleo-chemicals has been carried out from two distinct ways. The first one corresponds to the double-bond modification of crude oils or fatty acid derivatives. The second one is the carboxylic acid group modification of vegetable oils [2, 3]. The chemical fictionalizations of unsaturated oils to produce polyols have been widely developed to prepare new polyurethane structures,

In this study, *Semecarpus anacardium* L.f. (Bhallataka) which grows naturally without any cost and care by the time, is analyzed and investigated as new applications for "Bhavanol'' in the polymer field. *Semecarpus anacardium* oil (Bhavanol) is a valuable agro-byproduct and renewable resource which consists mainly of substituted phenols. Renewable natural resources that can be serving as alternative feed stocks for the chemical industry. In this respect Bhavanol (*Semecarpus anacardium* nut oil) which is isolated from nuts and root bark extracts is an abundant agricultural by product, holds considerable promise as a source of unsaturated phenol, an excellent monomer for polymer and chemical industries.

Out of the several applications investigated for bhavanol, the most prominent Thiol-ene addition is the radical addition of thiols to C=C double bond in which any alkene functional group can participate. It is important to note that, thiol-ene reaction is the most simple, an efficient method for modification and polymerization of alkenes. Due to this characteristic nature, it can be used as green procedure for thiol-ene addition reaction with plant oils and their fatty acid derivatives, which naturally possess double bonds.

2. Thiol-ene reaction

The reaction which is applied for the bhavanol, this reaction is also called as alkene hydro thiolation, it is an organic reaction between a thiol and an alkene based substance to form an alkyl sulphide. This reaction was first reported in 1905 by Posner and co-workers [4]. But it gained prominence in the last 1990s and early 2000s for its feasibility and wide range of applications [5, 6]. This reaction is accepted as a click chemistry reaction gives the reaction results with height yield, stereoselctivity, high rate and thermodynamic driving force.

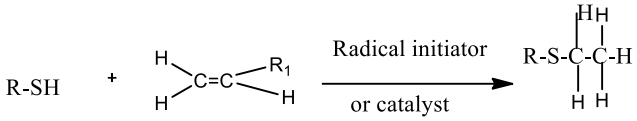


Fig 1: General mechanism of thiol-ene reactions

The reaction results in a anti-markovnikov addition of a thiol compound to an alkene. This reaction is synthetically useful for organic chemistry. Thiol-ene reactions have numerous applications in material and biomedical sciences[7] as well as Polymer industry.

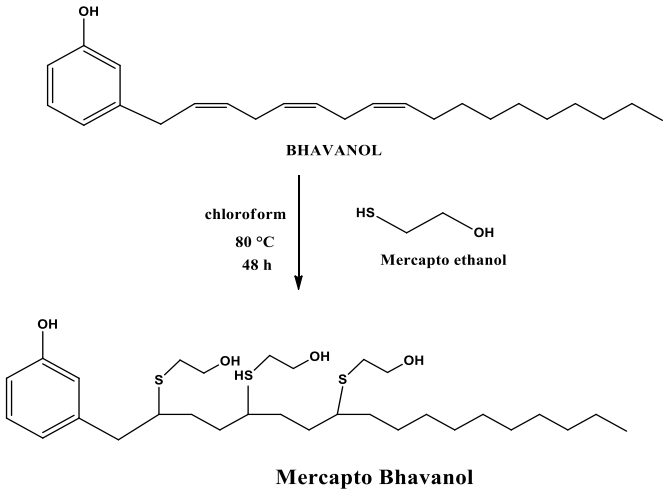
The novelty of our coupling reaction is the ability to regenerate novel bhavanol by reactions with thiol, click chemistry describes a type of chemical reaction that is often used to build libraries of compounds. It employs simple reactants that do not require pre-treatment, such as protection and it usually involves a one-pot reaction in which the reactants are combined using mild conditions and it requires little –to-no purification.

3. Bhavanol reactions with Thiol-enes

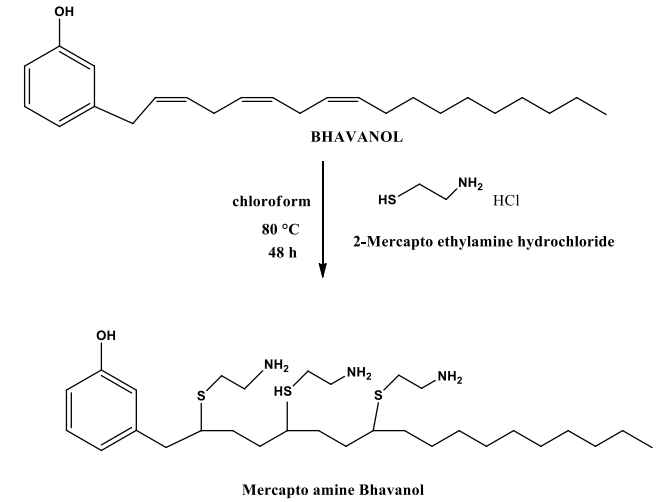
Bhavanol mainly contains unsaturation in the side chain this can be the basis for additional polymerization using free radicals or ionic initiator, this Noval Bhallataka can be polymerized by varity of techniques like reaction with

mercapto ethanol, 2-mercapto ethylamine hydrochloride and thioglycolic acid, rather than the reactions like hydrogenation, sulphonation, esterification, etherification, nitration.

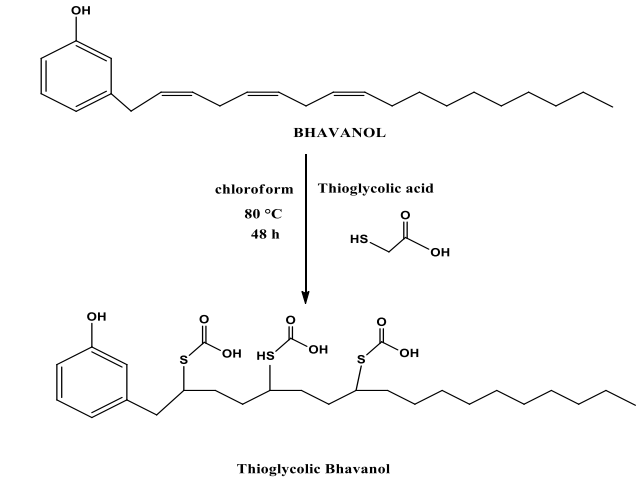
3.1 Bhavanol with mercapto ethanol reaction



3.2 Mercapto amine Bhavanol



3.3 Thioglycolic bhavanol from bhavanol



4. Conclusion

The efficient thiol addition onto bhavanol leading to bio based polyol, were demonstrated. Experimental parameters of mercaptoethanol, 2-Mercapto ethyl amine hydrochloride, Thioglycolic acid addition onto un saturated chains were investigated and optimized. The most important feature probably arose from the number of double bonds per chain in bhavanol which strongly influenced the thiol grafting yield, and the Thiol products exhibits lubricarting properties, compounds based on bhavanol or polymers modified by bhavanol shows good miscibility with petrochemical based products and bhavanol and bhavanol products can improve the resistance to degradation, bacteria, termites and recession of materials, bhavanol can also improve the chemical and physical property We developed a real chemical toolbox based on thiol-ene coupling and we can synthesize a library of bio based building blocks with various functions and functionality from the bhavanol.

The synthesized building blocks reported in this contribution are polyols, poly acids from bhavanol derivatives. We synthesized new amine-functionalized bhavanol from bhavanol and cysteamine. This bio based amine reactant is a very interesting since it bears aromatic rings for epoxy-amine formulations in coating applications. We demonstrated that bhavanol cysteamine has similar properties than Mannich-product without the drawbacks as the use of hazardous products such as formaldehyde or toxic amines. The bhavanol cysteamine has the advantage to use the unsaturations of the aliphatic chain which prevents the plasticization in the case of the phenalkamine.

References

1. Gunstone FD. Eur. J Lipid Sci. Technol. 2001; 103:307-314.
2. Corma A, Iborra S, Velty A. Chem. Rev. 2007; 107:2411-2502.
3. Zanetti-Ramos BG, Lemos-Senna E, Soldi V, Borsali R, Cloutet E, Cramail H. Polymer. 2006; 47:8080-8087.
4. Posner. Theodor Beitrage Zu Posner, Theodor. Beiträgezur Kenntniss der ungesättigten Verbindungen. II. Ueberdie addition von Mercaptanen an ungesättigte Kohlenwasserstoffe. Berichteder deutschen chemischen Gesellschaft. 1905; 38(1):646-657. doi:10.1002/cber.190503801106
5. Lowe, Andrew B. "Thiol-ene "click" reactions and recent applications in polymer and materials synthesis". Polym. Chem. 2010; 1(1):17-36. doi:10.1039/B9PY00216B
6. Nilsson Camilla, Simpson Neil, Malkoch Michael, Johansson Mats, Malmström. Eva Synthesis and thiol-ene photo polymerization of allyl-ether functionalized dendrimers. Journal of Polymer science Part A: Polymer chemistry. 2008; 46(4):1339-1348.