Arun K Sinha, Ph.D.
Chief Scientist

Medicinal Process Chemistry
C.S.I.R.-Central Drug Research Institute (C.D.R.I.)
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Personal Details

Date of Birth: 8 January 1961

Main Research Domain

Organic Chemistry/Green Chemistry/Natural Products/Medicinal Chemistry/Biotransformation/Natural Color and Dyes

Education

Ph. D (1990) Department of Chemistry, Indian Institute of Technology, Delhi

M.Sc. (1984) in Organic Chemistry, Banaras Hindu University,Varanasi, U.P.

Postdoctoral Experiences

2007-2008 **Visiting Scientist** (on sabbatical leave)

Department of Chemistry, Umea University, Sweden

2003-2004 **Visiting Scientist** (on sabbatical leave)

Biological, Chemical and Physical Sciences, Illinois Institute of Technology, 3101 S. Dearborn, Chicago, Illinois-60616, USA.

1996-1997 **Post-doctoral Research Associate**

Beckman Institute for Advanced Science and Technology, Biomedical Magnetic Resonance Laboratory, College of Medicine, University of Illinois at Urbana Champaign, Urbana, Illinois-60801 (USA)

1994-1995 **Post-doctoral Research Associate**

Biological, Chemical and Physical Sciences, Illinois Institute of Technology, 3101 S. Dearborn, Chicago, Illinois-60616 (USA)

Industrial Positions held

1992-1993 **Senior Research Officer**

Research and Development Centre (Chemical and Pharmaceutical Division) of "Max-GB India Limited", Okhla, New Delhi.

1991-1992 **Research Associate**

Research and Development Centre (Chemical and Polymer Division) of "Vam Organic Chemical Limited", Gajraula, U.P.

1990-1991 **Research Scientist**

Research and Development Centre (Chemical and Pesticide Division) of "Northern Mineral Limited", Gurgaon, Haryana.

Thesis Supervision

Ph D Thesis Awarded (09)

1. Dr Bhupendra Prasad Joshi (**2004**),
2. Dr Anuj Sharma (**2006**)
3. Dr Vinod Kumar (**2008**)
4. Dr Anu Bhardwaj (**2010**) (as a co-guide)
5. Dr Abhishek Sharma (**2010**)
6. Dr. Upendra Sharma (**2011**)
7. Dr. Nandini Sharma (**2012**)
8. Dr. Rakesh Kumar (**2012**)
9. Naina Sharma (**2012**)

In progress (**5**) (JRF/SRF)

Awards/Fellowship/Recognition/Honours

2006 Selected as **one of the 40 scientists** for its **technopreneurship** development program and invited for a brain storming session with scientific leaders from MIT, USA under an International Symposium on "Technopreneurship in Academia and Industry" organized at New Delhi, January, 2006 (Highlighted in a national newspaper **Hindustan Times** dated 29 January 2006).

2006 **Life membership** for Himalayan Phytochemicals & Growers Associaion (HIMPA), Mandi, Himachael Pradesh

2008 **Life membership** for Indian Society of Analytical Scientist (ISAS), Delhi

2009 **Life membership** for The National Academy of Sciences (NASI)

2009 **Life membership** for Chemical Research Society of India (CRSI)

2009 **Dr. P.D. Sethi** for the best Indian research paper Annual **Award-2009** on Application of TLC/HPTLC in Pharma, Herbal and Miscellaneous Analysis

(2nd Prize)

2010 Dr. P.D. Sethi Award-2010 for the best Indian research papers in

Pharmaceutical Analaysis using HPLC

(Certificate of Merit)

2011 Dr. P.D. Sethi Award-2010 for the best HPTLC Paper

(Certificate of Merit)

2012 Felicitation by. I.H.B.T. on National Science Day (28 Feb. 2012) for publishing a paper in international journal of high repute (Angew. Chem. Int. Ed., **I F. 13.45**)

2013 **Bronze Medal Recipient , Chemical Research Society of India** (CRSI),India

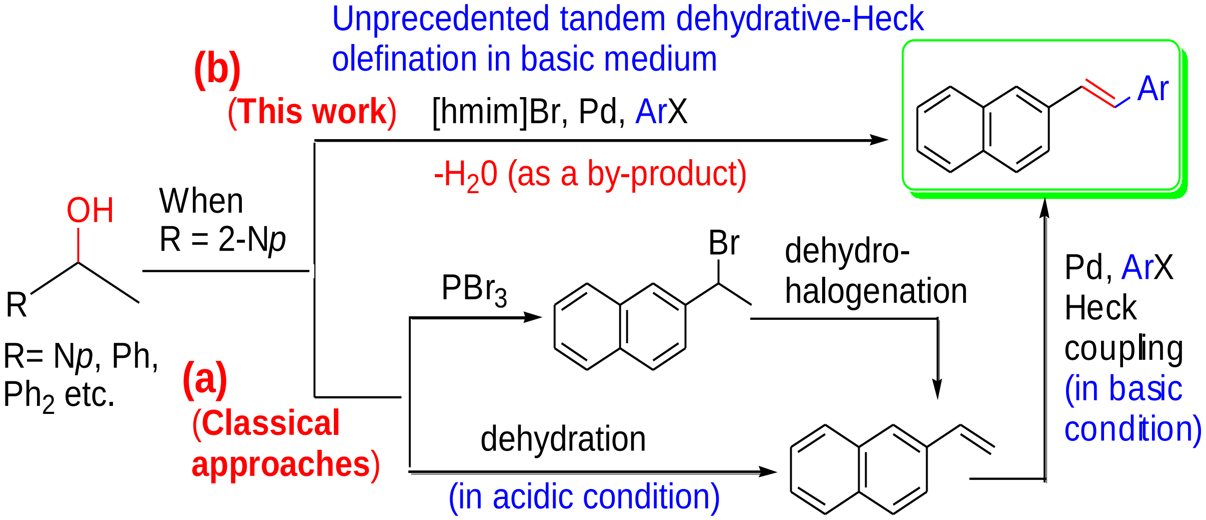
2013 Felicitation by. I.H.B.T. on National Science Day (28 Feb. 2012) for publishing a paper in international journal of high repute (Angew. Chem. Int. Ed., **I F. 13.45**)

Salient features of some R& D Achievements

In context to national/international issue, the long term contribution are broadly in the area of synthetic organic, medicinal chemistry and industrial chemistry to evaluate novel and safer environmental protocols and its impact in human health and environmental sciences utilizing the tools of green chemistry besides sustainable exploitation of plants of western Himalayan region for development of natural colors, radioprotectors (for defense purposes) and other natural products of commercial utility. The details are given below:

(A) Development of Green Protocols in the Synthesis of Bioactive Organic Molecules: Ionic liquids, Microwave, Biocatalysis, Multi-component Reactions (MCRs) and Water Chemistry as Green tools

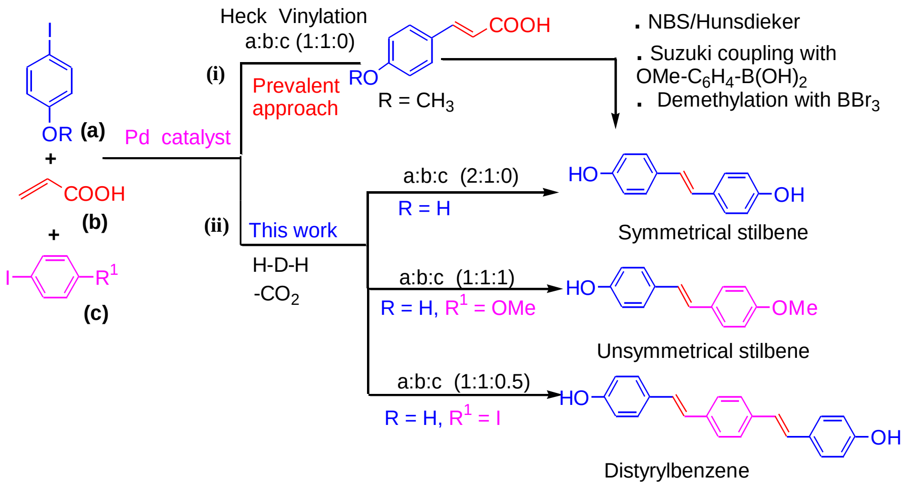
(i) Palladium-catalyzed dehydrative Heck-olefination of secondary arylalcohols in ionic liquids: Towards a waste-free strategy for tandem synthesis of stilbenoids:
A tandem strategy has been developed wherein for the first time **secondary aryl alcohols** are directly coupled with aryl halides to provide **stilbenoids** through a dehydrative Heck sequence in the ionic liquid [hmim]Br, and with water as a by-product under microwave irradiation. Classical methods do not permit this sequence to proceed in one pot, and some methods require multiple steps (Sinha et al *Angew. Chem. Int. Ed. 2012, 51, 2636-2639*).



Prevalent approaches (a) and present work (b) for the conversion of 2° aryl alcohols into stilbenoids

(ii) Tandem Heck/Decarboxylation/Heck Strategy: Protecting-group-Free synthesis of Symmetric and Unsymmetric hydroxylated Stilbenoids

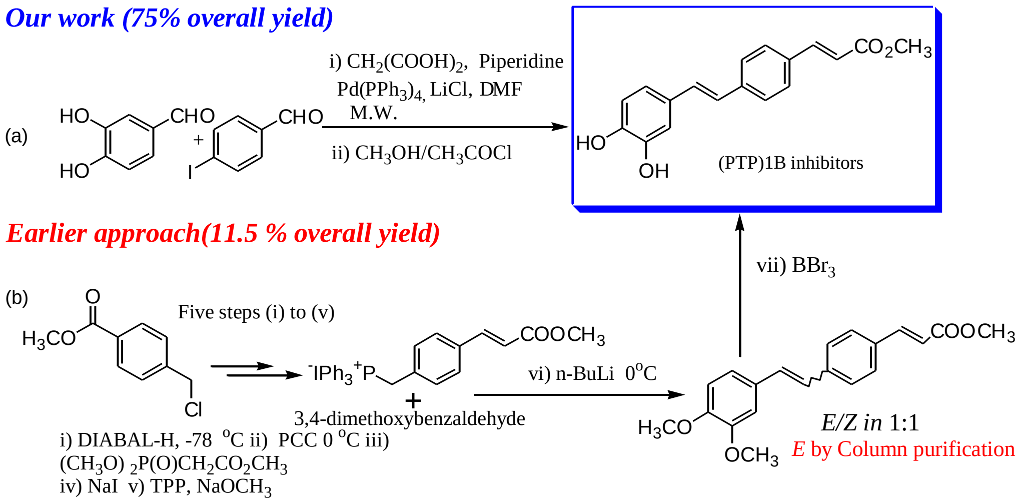
A tandem/sequential *Heck-Decarboxylation-Heck* (H-D-H) strategy has been developed for the synthesis of hydroxylated symmetrical or unsymmetrical stilbenoids utilizing 4-halophenols and acrylic acid as coupling partners. The protecting-group-free H-D-H operation is mediated by a single palladium catalyst and provides access towards differently substituted stilbenoids merely by tuning of concentration of halophenols with respect to acrylic acid and reaction temperature. The developed protocol has been successfully applied to the formal sequential synthesis of antineoplastic agent pterostilbene and a distyrylbenzene, whose fluorinated analogs have potent *β*- amyloid binding affinity (Sinha et al *Angew. Chem. Int. Ed. 2012,* 51,12250-12253).



Synthesis of hydroxylated symmetrical/unsymmetrical stilbenoids and distyrylbenzene via Tandem/Sequential Heck-Decarboxylation-Heck (H-D-H) strategy.

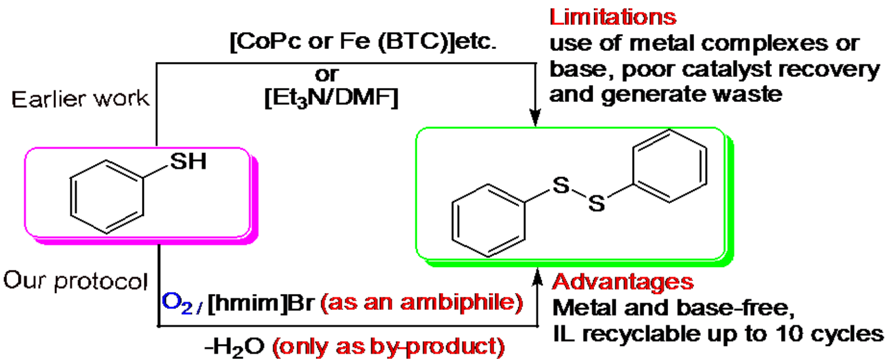
(iii) One-pot multi-component synthesis of antidiabetic stilbene-cinamoyl hybrids via Pd-catalyzed orthogonal Knoevenagel/Perkin-decarboxylation-Heck/Suzuki sequence:

A one pot double Knoevenagel-decarboxylation-Heck transformation was applied for the first concise and efficient synthesis of a *potent* protein tyrosine phosphatase **(PTP)1B inhibitors** (*antidiabetic drug candidate*) in 75% yield (Sinha et al WO/2010/113005) as compared to previously reported seven step approach (yield 11.5%) (Sinha et al Chem. Eur. J., **2011**, 17, 10350-10356).

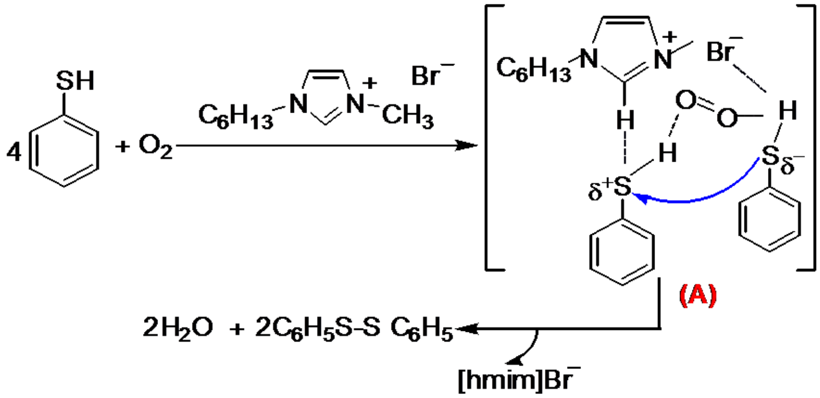


(iv) First Metal and Base-Free Selective Oxidative Coupling of Thiols in Neat Ionic Liquids: NMR Probed “Ambiphilic” Character of Neutral [hmim]Br Towards Atom-Efficient Synthesis of Disulfides

Selective aerobic oxidation of thiols into disulfides in neat [hmim]Br without relying on any base/metal catalyst (Scheme 1) has been developed wherein ^{1}H NMR based mechanistic study proved the cooperative role of imidazolium cation and halide anion of neutral IL as an ambiphile (Sinha et al *Adv. Synth. Catal.*,, **2012**, 354, 2012-2112).



Mechanistically, it was presumed that [hmim]Br exhibited an ambiphilic “electrophilic and nucleophilic” dual activator role through intermediate (A) (Scheme 2) in which S atom of thiophenol undergoes hydrogen bond (H-B) formation (electrophilic activation) with C-2 hydrogen atom of [hmim] cation due to its H-B donor ability. Likewise, Br anion of IL interacts with hydrogen atom of another molecule of thiophenol through H-B (nucleophilic activation) formation. Subsequently, nucleophilic attack of $S^{\delta-}$ to electrophilic $S^{\delta+}$ led to the formation of S-S bond with release of water as by product.



Scheme 2. Proposed reaction mechanism

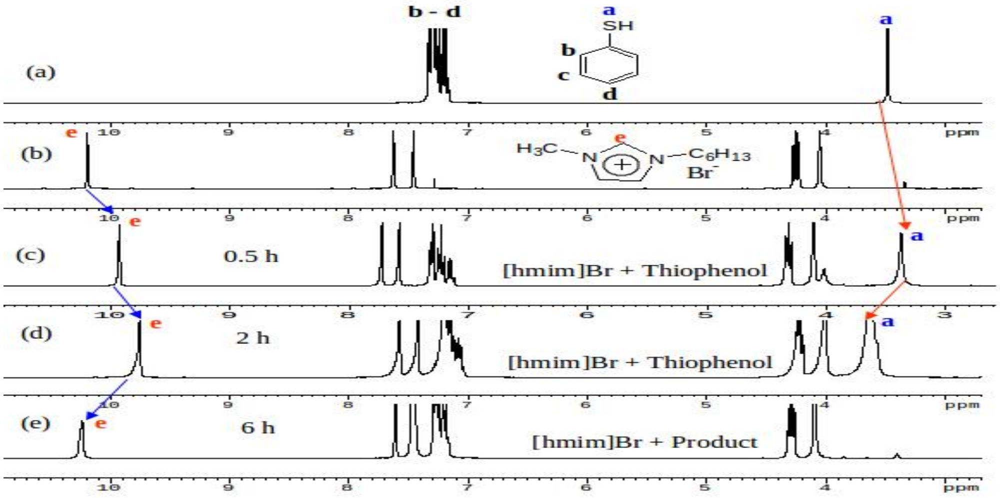
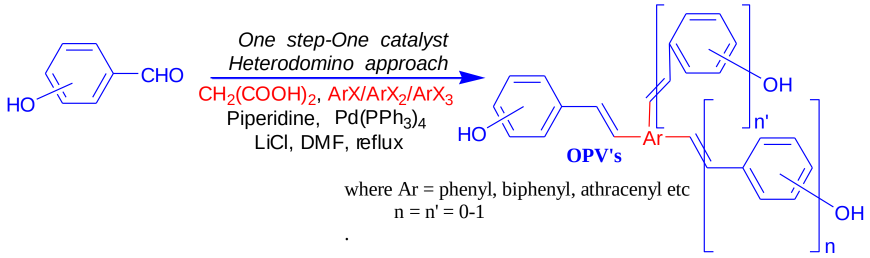


Figure 1. ^{1}H NMR spectra of (a) thiophenol, (b) [hmim]Br and their interaction at different time intervals i.e. (c) 0.5 h, (d) 2 h and (e) 6 h in $CDCl_3$ solvent.

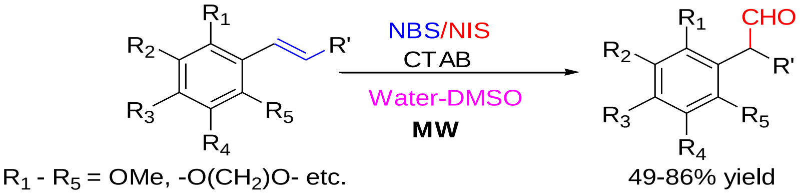
(v) Palladium catalyzed direct olefination of benzaldehydes into oligo(*p*-phenylenevinylene)s:

A new one pot approach involving Knoevenagel-decarboxylation-Heck sequence has been developed for the direct olefination of benzaldehydes into biologically/industrially important hydroxy functionalized oligo(*p*-phenylene-vinylene)s. In addition, one of the synthesized compounds was also found to show visible and fluorescent **fluoride sensing** in aqueous as well as organic medium (Sinha et al *Chem. Commun.,* **2010**, 46, 3283)



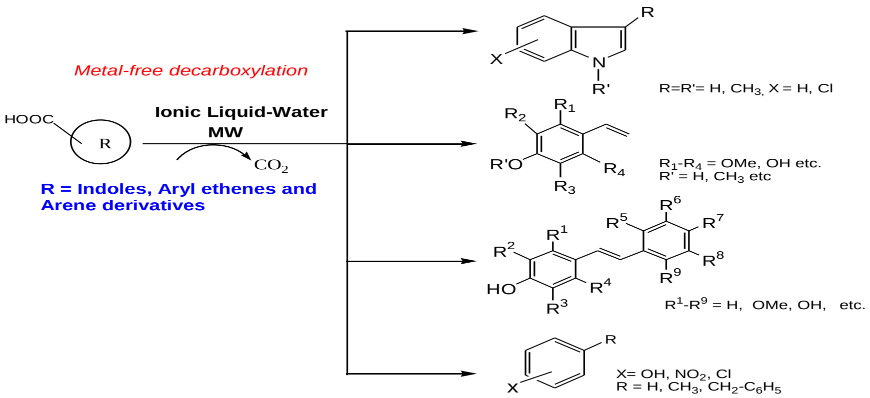
(vi) Microwave induced single step synthesis of α-aryl aldehydes from arylalkenes in water medium (an intermediate for non-steroidal anti-inflammatory drugs):

A new approach has been developed for one step and metal-free synthesis of biologically and synthetically important **α-arylaldehydes** from **arylalkenes** using *N*-halosuccinimide and phase transfer catalyst in neat water or water-DMSO/Dioxane. (Sinha et al *Chem. Commun.,* **2010**, 46, 3283).



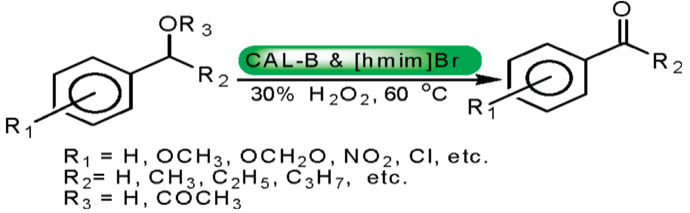
(vii) Ionic liquid and microwave-assisted decarboxylation of *N*-heteroaryl and aryl carboxylic acids:

Ionic liquids have been introduced as efficient catalysts cum solvents for metal and quinoline free decarboxylation of diverse *N*-heteroaryl and aryl carboxylic acids under microwave irradiation. The developed methodology offers several inherent advantages like reduction in waste and hazards, recyclability of reagent system, short reaction times besides ease of product recovery (Sinha et al *Adv. Synth. Catal.,* **2008**, 350, 2910).

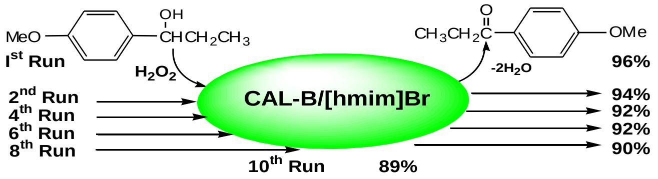


(viii) Biocatalytic promiscuity of lipase for metal-free activation of H_2O_2 in chemoselective oxidation of aryl alcohols/acetates

A unique synergistic combination of lipase and ionic liquid [hmim]Br is reported for metal-free H_2O_2 activation, which is the first example of **biocatalytic promiscuity of CAL-B** for chemoselective oxidation of aryl alcohols/acetates. The catalytic system exhibits excellent functional group compatibility under neutral conditions besides reusability up to ten cycles thereby making the process economically and environmentally viable (Sinha et al *Org. Lett.*, **2009**, 11, 4846).



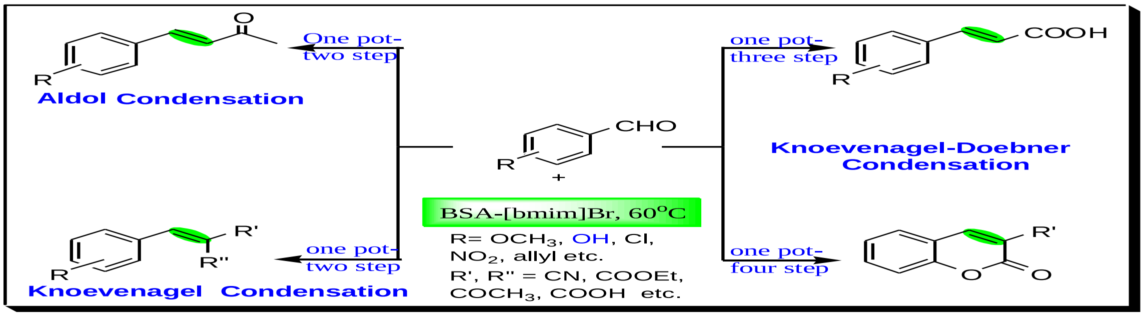
First Lipase-IL catalyzed oxidation of aryl alcohols by H_2O_2



Recyclability Study of Catalytic System

(ix) First bovine serum albumin (BSA) promoted synthesis of enones, cinnamic acids and coumarins in ionic liquids:

For the first time, we have uncovered the role of protein impurities in porcine pancreas lipase (PPL), rather than catalytic promiscuity, for olefinic bond formations. Consequently, a novel and highly efficient environment friendly approach involving synergistic catalysis by **BSA-[bmim]Br** is developed for the synthesis of (*E*)-*α*,*β*-unsaturated compounds including *one-pot cascade synthesis of cinnamic acids and coumarins via aldol, Knoevenagel and Knoevenagel-Doebner condensation* (Sinha et al *Adv. Synth. Catal.,* **2011**, 353, 871-878).

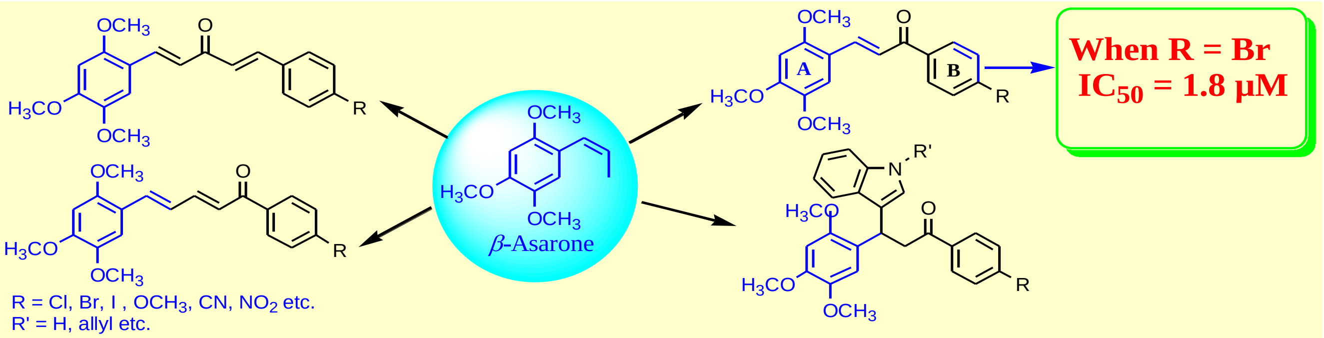


First BSA-catalyzed Aldol/Knoevenagel-Doebner condensation in [bmim]Br

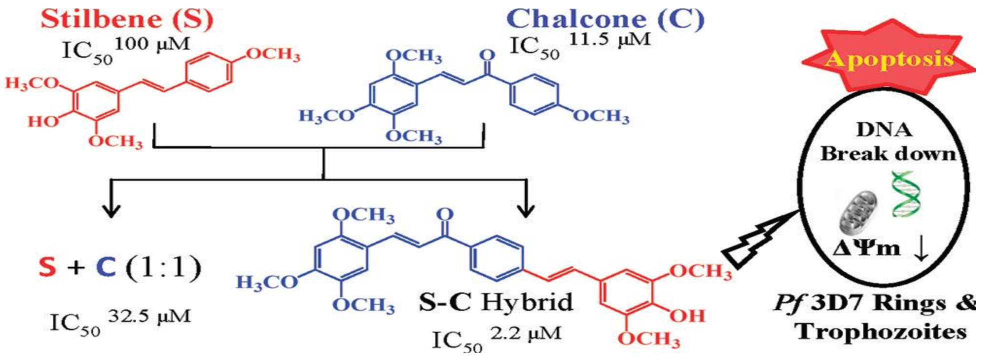
(B) Chemical modification of abundantly available plant derived molecules and their analogues into value added products using green methodologies:

(i) *Acorus calamus:* *A. Calamus* (family: *Araceae*), also known as “sweet flag" ("Vatch" in Hindi), has been known for numerous medicinal properties in Ayurvedic system of India, Chinese system of medicine besides wide application in essential oil industries. However, calamus oil originating from tetraploid and hexaploid strains contain a very high percentage of beta-asarone varying from 70 to 90 %. The higher percentage of beta-asarone is recently proved to be toxic and carcinogenic.

As a result, the use of calamus oil is now prohibited in flavour, perfumery and food, thereby, adversely affecting the economic prospects of this crop for industries as well as farmers. In the above context, a cost effective technology was developed for conversion of abundantly available toxic beta-asarone rich *Acorus calamus* oil to a wide range of commercially important bioactive phenylpropanoids besides potent antimalarial scaffolds with 1.8 µM IC_{50} (Sinha et al *Eur. J. Med. Chem.*, 2010, 45, 5292 and *Org. Biomol. Chem.* 2011, 9, 5211-5219).



In addition of above potent antimalarial chalcones, a green protocol was developed for the first time for the synthesis of Stilbene-Chalcone Hybrids and evaluated as a new class of Antimalarial Scaffolds that trigger cell death through Stage Specific Apoptosis (Sinha et al *J. Med. Chem.* ***2012**,* 55, 297−311)

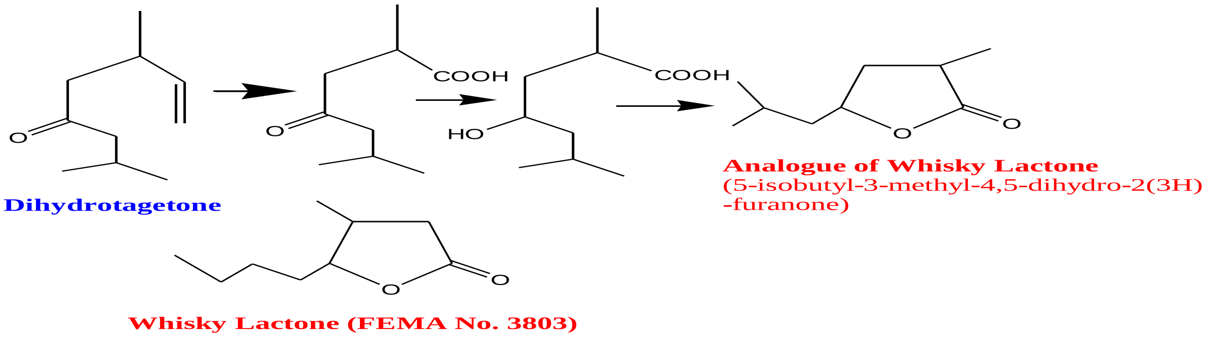


Novel stilbene−chalcone (S-C) hybrids were synthesized via a sequential Claisen−Schmidt−Knoevenagel-Heck approach and evaluated for antiplasmodial activity in *in vitro* red cell culture using SYBR Green I assay. The most potent hybrid (**S-C hybrid**) showed IC_{50} of 2.2, 1.4, and 6.4 *µ*M against 3D7 (chloroquine sensitive), Indo, and Dd2 (chloroquine resistant) strains of *Plasmodium falciparum*, respectively. Further, S-C hybrid caused chromatin condensation, DNA fragmentation, and loss of mitochondrial membrane potential in *Plasmodium falciparum*, thereby suggesting their ability to cause apoptosis in malaria parasite (Sinha et al *J. Med.Chem.* ***2012****,* 55, 297)

(ii) Tagetus minuta:

Tagetes minuta (family: *Asteracea*) oil has been known for long due to its pleasant and powerful odor and thus widely used in flavour industries. However, at both national and international markets, Tagetes oil does not have an attractive price as some of its constituents (tagetone, dihydrotagetone, ocimenone and ocimene etc.) undergo polymerization upon storage for a long time.

In the above context, a novel synthetic method has been developed for converting dihydrotagetone, isolated from *Tagetes* species into coconut flavoured 5-isobutyl-3-methyl-4,5-dihydro-2(3H)-furanone, an analogue of whisky lactone (Sinha et al. US patent 6,579,992; AU patent 780476 B; GB patent 2375535 A and *Aust. J. of Chem.2007, 60, 124)*



Such coconut flavored furanone derivative has been identified as the most valuable additive responsible for the flavor of high quality whisky, wine, cognac and scotch etc as well as various baked goods and confectionary. It is worthwhile to mention that Tagetes oil of Uttaranchal area contains high percentage of dihydrotagetone (in comparison to Himachal Pradesh) which has hampered its industrial potential. In this context, our developed protocol imparts a gainful utilization of above resource, thereby, providing a boon for farmers of Uttaranchal.

(C) Green and cost effective process for isolation of natural vanillin from vanilla pods on pilot scale

Vanilla is world's most popular flavoring material and second most expensive spice after saffron. However, natural vanillin is not easily available in the market (cost ranges between US$ 2000 to US$ 3000) and generally either diluted ethanolic extract containing about 1.0 gL^{-1} vanillin (labeled as natural vanilla) or much cheaper synthetic vanillin (cost ranges between US$ 15 to US$ 20) is traded in international market for flavoring purpose.

Nevertheless, many countries likes USA has made it mandatory for the use of natural vanillin in food items, particularly in baby foods, to offset the ill-effects of petro-derived synthetic vanillin. In this context, an efficient, green and industrially feasible protocol for the isolation of natural vanillin (in crystalline form) from vanilla beans has been developed on a pilot scale (so far carried upto 10 kg batch) (Sinha et al, patent application 0107NF2006).

Many entrepreneurs have shown keen interest in the above developed protocol and talks are in progress for the transfer of technology.

(D) Natural Colors and Dyes: *A green process to obtain crystalline and non-hygroscopic colored fractions from natural sources*

The demand for use of natural colors and dyes in food, textiles and pharmaceutical industries worldwide is increasing day by day due to disastrous effects like carcinogenicity, allergenicity, including their non- biodegradability of synthetic dyes and colors.

In this scenario, a green and cost effective process has been developed for the isolation of natural colors/dyes from various plants, including commonly used *fruits and vegetables*, such as *Hippophae*, *Rhododendron*, Black carrot, Tea, Amla, Methi, Coriander and *Rheum* etc (Patent filed (WO/2010/109286/C.S.I.R. No. 0091NF 2008).

Many of the dye yielding plants have been successfully scaled up (10-50Kg) with the above process. Discussions with related industrialists are in progress for the transfer of the technology.

Technology Transferred

(i) A green technology for producing FEMA GRAS approved vinyl phenols (4-vinyl guaiacol, NO. 2675) and 4-vinylphenol, NO. 3739) was successfully transferred to Aroma Aromatics & Flavours, 67-68-69, Industrial Area, Baddi, Solan, H.P.:

An indigenously developed green technology has led to the manufacture of hitherto imported 4-vinyl guaiacol, a FEMA approved flavoring agent, in India itself, thus saving precious foreign exchange. The above process involved for the first time a simultaneous condensation-double decarboxylation phenomenon which provide new prospective on **100 years Knoevenagel-Doebne**r reaction**,** now **renamed as Knoevenagel-Doebner-Sinha protocol**. This has also drastically reduced the production cost of 4-vinylguaiacol from Rs 1.2 lakhs/Kg to Rs 35,000/Kg. Moreover, a conceptually new mechanistic pathway was also proposed for above transformation (**Sinha et al** US Patent 06989467, Tetrahedron, 2007, 63, 960).

The successful transfer of above cost effective technology to flavor industry attracted wide attention and the same was highlighted in a national newspaper (Hindustan Times dated 29 January 2006) and cover page of “CSIR News” (Vol 56 (7), 15 April 2006).

Patents: 16 (mainly USA)

Selected Publication (Total number of publications=89)

S. No	**Authors**	**Year**	**Title**	**Journal**	**Impact factor ****
1	U.K. Sharma, N. Sharma, R. Kumar, **A. K. Sinha***	**2013**	Biocatalysts for Multicomponent Biginelli reaction: Bovine Serum Albumin triggered waste-free Synthesis of 3,4-Dihydropyrimidin-2-(1H)-ones	*Amino Acids* 44,1031-1037	**3.25**
2	A. Shard, N. Sharma, R. Bharti, S. Dadhwal, R. Kumar, **A. K. Sinha***	**2012**	Tandem Heck-Decarboxyla-tion-Heck Strategy for Protecting-group-free Synthesis of Symmetrical and Unsymmetrical Hydroxylated Stilbenoids from Halophenols and Acrylic acid	*Angew. Chem. Int. Ed.* 51,12250-12253	**13.45**

3	R. Kumar, A. Shard, R. Bharti, Y. Thopate, **A. K. Sinha*** 	**2012**	Pd-catalysed dehydrative-Heck olefination of 2° aryl alcohols in ionic liquid: Towards a waste-free strategy for tandem synthesis of stilbenoids	*Angew. Chem. Int. Ed.* *51, 2636-2639*	**13.45**
4	N. Sharma, D. Mohanakrishnan, A. Shard, A. Sharma, Saima,**A.K. Sinha*,**D. Sahal*****	**2012**	Stilbene-chalcone hybrids: Design, synthesis and evaluation as a new class of antimalarial scaffolds that trigger cell death through stage specific apoptosis	*J. Med. Chem.* 55, 297−311	**5.25**
5	R. Kumar, N. Sharma, U.K. Sharma, Amit Shard, **A. K. Sinha***	**2012**	First metal and base-free selective oxidative coupling of thiols in neat ionic liquids: NMR probed “Ambiphilic" character of neutral [hmim]Br towards atom-efficient synthesis of disulfides	*Adv. Synth. Catal.* 354, 2107-2112	**6.05**
6	N. Sharma, U.K. Sharma, R. Kumar, Richa, **A. K. Sinha***	**2012**	Green and recyclable glycine nitrate ($\mathrm{GlyNO_3}$) ionic liquid triggered multicomponent Biginelli reaction for the efficient synthesis of dihydropyrimidinones	*RSC Advance* *2, 10648-10651*	**-**
7	N. Sharma, A. Sharma, A. Shard, R. Kumar, Saima, **A. K. Sinha***	**2011**	Pd-Catalyzed orthogonal Knoevenagel/Perkin-Decarboxylation-Heck/Suzuki sequences: Tandem transformation of benzaldehydes into hydroxy functionalized antidiabetic Stilbene-Cinnamoyl hybrids and Unsymmetrical Distyrylbenzenes	*Chem. Eur. J.* 17, 10350-10356	**5.93**
8	N. Sharma, U. K. Sharma, R. Kumar, N. Katoch, R. Kumar, **A. K. Sinha***	**2011**	First Bovine serum albumin promoted synthesis of enones, cinnamic acids and coumarins in ionic liquid: An insight into the role of protein impurities in porcine pancreas lipase for olefinic bond formation	*Adv. Synth. Catal.* *353,871-878*	**6.05**

9	A. Sharma, N. Sharma, A. Shard, R. Kumar, D. Mohanakrishn-an, Saima, **A. K. Sinha***, D. Sahal	**2011**	Tandem allylic oxidation-condensation/esterification catalyzed by silica gel: An expeditious approach towards antimalarial diaryldienones and enones from natural methoxylated phenylpropenes	*Org. Biomol. Chem.* 9, 5211-5219	**3.69**
10	E. Chorell, C. Bengtsson, T. S.-L. Banchelin, P. Das, H. Uvell, **A. K. Sinha,** J. S. Pinkner, S. J. Hultgren, F. Almqvist	**2011**	Synthesis and application of bromomethyl substituted scaffold to be used for efficient optimization of anti-virulence activity	*Eur. J. Med. Chem.* 46, 1103-1116	**3.35**
11	R. Kumar, N. Sharma, N. Sharma, A. Sharma, **A. K. Sinha***	**2011**	Metal-free activation of H_2O_2 by synergic effect of ionic liquid and microwave: Chemoselective oxidation of benzylic alcohols to carbonyls and unexpected formation of anthraquinone in aqueous condition	*Mol. Divers*. 15,687–695	**3.15**
12	R. Kumar, D. Mohanakrishn-an, A. Sharma, N. K. Kaushik, K. Kalia, **A. K. Sinha***, D. Sahal	**2010**	Reinvestigation of structure-activity relationship of methoxylated chalcones as antimalarials: Green synthesis and evaluation of 2,4,5-trimethoxy substituted patterns as lead candidates derived from abundantly available natural beta-asarone	*Eur. J. Med. Chem. 45, 5292-5301*	**3.35**
13	N. Sharma, A. Sharma, R. Kumar, A. Shard, **A. K. Sinha***	**2010**	One-pot two-step oxidative cleavage of 1,2-arylalkenes to arylketones instead of arylaldehydes in an aqueous medium: A complementary approach to ozonolysis	*Eur. J. Org. Chem.* 6025-6032	**3.32**
14	A. Sharma, N. Sharma, R. Kumar, A. Shard, **A. K. Sinha***	**2010**	Direct olefination of benzaldehydes into hydroxy functionalized oligo(p-phenylene-vinylene)s via Pd-catalyzed heterodomino Knoevenagel-decarboxy-lation-Heck sequence and its application for fluoride sensing pi-conjugated units	*Chem. Commun.* 46, 3283-3285	**6.17**
15	A. Sharma, N. Sharma, R. Kumar, U. K. Sharma, **A. K. Sinha***	**2009**	Water promoted cascade rearrangement approach towards α-aryl aldehydes from arylalkenes using N-halosuccinimides:An avenue	*Chem. Commun.* 5299-5301	**6.17**

			for asymmetric oxidation using phase transfer cinchona organocatalysis		
16	U. K. Sharma, N. Sharma, R. Kumar, R. Kumar, **A. K. Sinha***	**2009**	Biocatalytic promiscuity of lipase in chemoselective oxidation of aryl alcohols/acetates: A unique synergism of CAL-B and [hmim]Br for the metal-Free H_2O_2 activation	*Org. Lett.* 11, 4846-4848	**5.86**
17	A. Sharma, R. Kumar, N. Sharma, V. Kumar, **A. K. Sinha***	**2008**	Unique versatility of ionic liquids as clean decarboxylation catalyst cum Solvent: A metal- and quinoline-free paradigm towards synthesis of Indoles, styrenes, stilbenes and arene derivatives under microwave Irradiation in aqueous conditions	*Adv. Synth. Catal.* 350, 2910-2920	**6.05**
18	R. Kumar, A. Sharma, N. Sharma, **A. K. Sinha***	**2008**	Neutral ionic liquid [hmim]Br as a green reagent and solvent for mild and efficient dehydration of benzyl alcohols into (E)-arylalkenes under microwave irradiation	*Eur. J. Org. Chem.* 2008 (33), 5577–5582	**3.33**
19	U. K. Sharma, K. Sharma, N. Sharma, A. Sharma, H. P. Singh, **A. K. Sinha***	**2008**	Microwave assisted efficient extraction of different parts of *Hippophae rhamnoides* for the comparative evaluation of antioxidant activity and quantification of its phenolic constituents by RP-HPLC	*J. Agric. Food Chem.* 56(2), 374-379	**2.82**
20	**A. K. Sinha**,* V. Kumar, A. Sharma, A. Sharma	**2007**	An unusual, mild and convenient one-pot two-step access to (*E*)-stilbenes from hydroxy substituted benzaldehydes and phenyl-acetic acids under microwave activation: Revelation of a new facet on the classical Perkin reaction	*Tetrahedron* 63, 11070-11077	**3.03**
21	V. Kumar, A. Sharma, M. Sharma, U. Sharma, **A. K. Sinha***	**2007**	DDQ catalyzed benzylic acetoxylation of arylalkanes: A case of exquisitely controlled oxidation under sonochemical activation	*Tetrahedron* 63, 9718-9723	**3.03**
22	V. Kumar, A. Sharma, A. Sharma, **A. K. Sinha***	**2007**	Remarkable synergism in methylimidazole-promoted decarboxylation of substituted cinnamic acid derivatives in basic water medium under microwave irradiation: A clean synthesis of hydroxylated (E)-stilbenes	*Tetrahedron* 63, 7640-7646	**3.03**

23	A. Sharma, A. Swaroop, V. Pathania, **A. K. Sinha***	**2007**	An efficient chemoselective strategy for the preparation of (*E*)-cinnamic esters from cinnamaldehydes using heterogeneous catalyst and DDQ	*Tetrahedron* 63, 1000-1007	**3.03**
24	**A. K. Sinha**,* A. Sharma, B. P. Joshi	**2007**	One-pot two-step Synthesis of 4-vinylphenols from 4-hydroxy substituted benzaldehydes under microwave Irradiation: A new perspective on classical: Knoevenagel-Doebner Reaction	*Tetrahedron* 63, 960-965	**3.03**
25	A. Sharma, V. Kumar, **A. K Sinha***	**2006**	An efficient chemoselective hydrogenation of olefinic bond of alpha-beta-unsaturated carbonyl compounds with silica supported $PdCl_2$ and formic acid in aqueous medium under microwave irradiation	*Adv. Synth. Catal.* 348, 354-360	**6.05**
26	B. P. Joshi, A. Sharma, **A. K. Sinha***	**2006**	An Efficient One pot Two steps Synthesis of (E)-Cinnmaldehydes by dehydrogenation-oxidation of Arylpropanes with 2,3-Dicyano-5,6-dichlobenzoquinone (DDQ) under ultrasonic irradiation	*Tetrahedron* 62, 2590-2593	**3.03**
27	A. Sharma, B. P. Joshi, N. P. Singh, **A. K. Sinha***	**2006**	Unexpected formation aryl dialkyl carbinol as a side-product from the reaction of methoxyarylaldehydes with Grignard reagents	*Tetrahedron* 62, 847-851	**3.03**
28	N. P. Singh, A. P. Gupta, **A. K Sinha**,* P. S. Ahuja	**2005**	High performance thin layer chromatography method for quantitative determination Of four major anthraquinone derivatives in *Rheum emodi*	*J. Chromatogr. A* 1077, 202-206	**4.53**
29	S. C. Verma, N. P. Singh, **A. K. Sinha***	**2005**	Determination and locational variation in the quantity of hydroxyanthraquinones and its glycosides in rhizome of *Rheum emodi* using High Performance Liquid Chromatography	*J. Chromatogr. A* 1097, 59-65	**4.53**

* Corresponding author; ** Impact factor based upon Year 2011