

वार्षिक प्रतिवेदन Annual Report

2011-2012

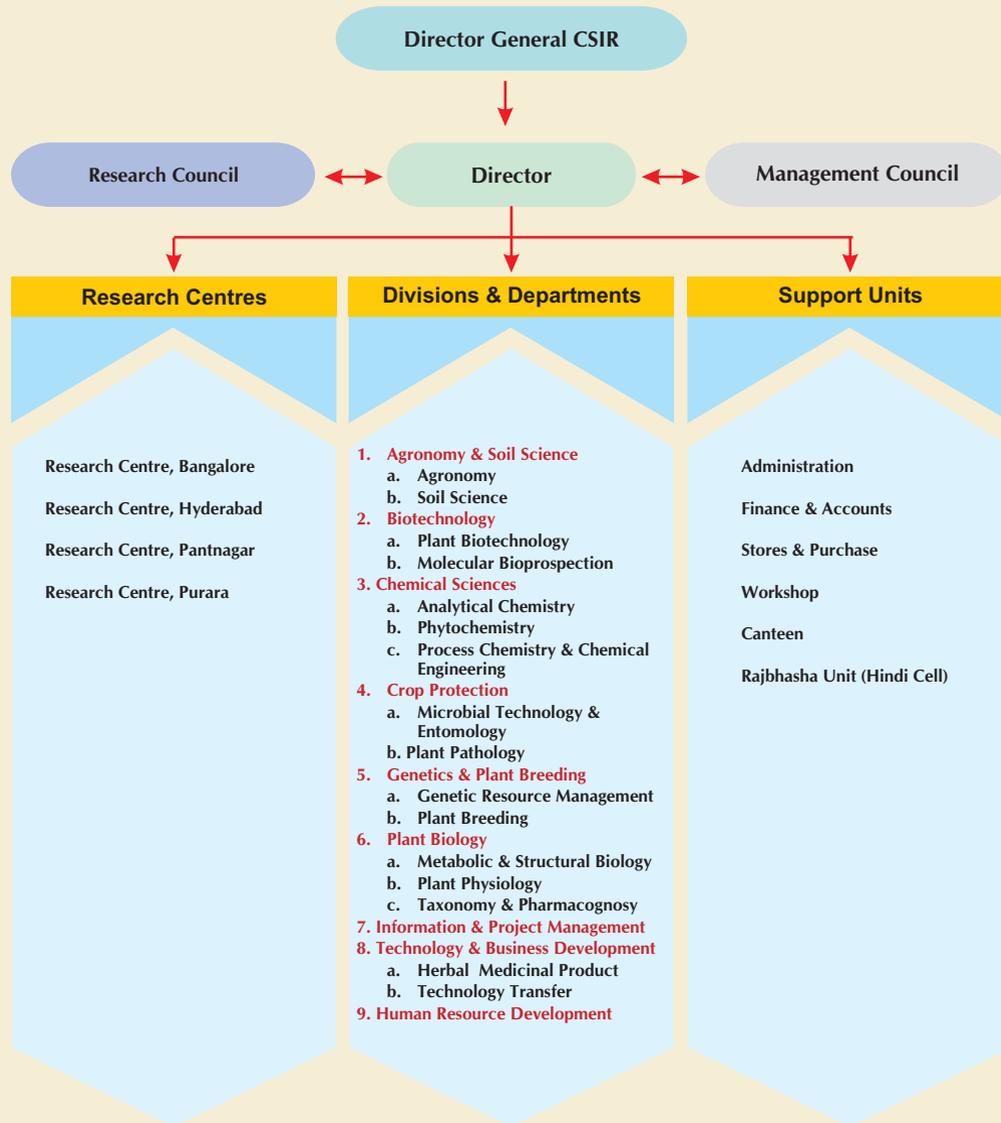


CSIR-Central Institute of Medicinal and Aromatic Plants

(Council of Scientific and Industrial Research)

Lucknow | India

Organizational Structure



वार्षिक प्रतिवेदन 2011-2012

With Best Compliments From

Director
CSIR-CIMAP



CSIR-Central Institute of Medicinal and Aromatic Plants

(Council of Scientific and Industrial Research)

Lucknow - 226 015, India

Acknowledgments

Research Council

Management Council

Project Leaders, Scientists, Technical Staff

Research Students and Scholars

Project Funding Agencies

MAPs Cultivators, Growers and Processors

A Team CSIR-CIMAP Effort

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मुझे संस्थान के वर्ष 2011-2012 का वार्षिक प्रतिवेदन प्रस्तुत करते हुए सुखद अनुभूति हो रही है। शोध, वैज्ञानिक सम्मेलनों, शोध प्रकाशनों और शोध प्रसार के दृष्टिकोण से यह एक उपलब्धि पूर्ण वर्ष था। यह वर्ष 11वीं पंचवर्षीय योजना का अन्तिम वर्ष होने के फलस्वरूप विभिन्न शोध परियोजनाओं से प्राप्त सफलताओं का लेखा-जोखा करना एक संतोषजनक अनुभव रहा। इसी वर्ष 12वीं पंचवर्षीय योजना के अनुसंधान योजनाओं का निर्धारण रचनात्मक परिचर्चा के उपरान्त किया गया, और तदनु रूप 11वीं पंचवर्षीय योजना की कुछ परियोजनाओं को जारी रखने का निर्णय लिया गया।

खस, सदाबहार, रोशा घास, पोस्ता व पोदीना जैसी परंपरागत सगंध एवं औषधीय फसलों पर गहनता से शोध बढ़ाने के साथ नये पौधों पर नये वैज्ञानिक अनुसंधान इस वर्ष की प्राथमिकताओं में थे। जैव सूचना विज्ञान का प्रयोग कर औषधीय रूप से महत्वपूर्ण पौधजन्य अणुओं और उनके व्युत्पन्नो की पहचान एवं

इनके औषधीय महत्व व कार्यविधि को बेहतर समझने के लिए जैव रासायनिक तथा कोशिका आधारित शोधों से न केवल विज्ञान की गुणवत्ता में सुधार किया अपितु, हमारे वैज्ञानिकों की समसामयिक शोध क्षमता को भी पुनः एक बार फिर प्रमाणित करता है।

विज्ञान की गुणवत्ता और मौलिकता का असली परीक्षण शोध पत्रों और पेटेन्ट द्वारा होता है। संस्थान के लगभग 100 उच्च इम्पैक्ट वाले शोध पत्र एवं 8 पेटेन्ट द्वारा यह स्वप्रमाणित होता है। इन उपलब्धियों को प्राप्त करने में सहयोग देने वाले वैज्ञानिकों को मेरा साधुवाद। शोध के अतिरिक्त संस्थान ने इस वर्ष दो महत्वपूर्ण वैज्ञानिक सम्मलेनों “खस और पर्यावरणीय परिवर्तन” विषय पर पांचवाँ अन्तर्राष्ट्रीय खस सम्मेलन (अक्टूबर-2011) और भारतीय जैव रसायन समिति का 80वाँ वार्षिक सम्मेलन (नवम्बर -2011) का सफल आयोजन किया। इन आयोजनों की सफलता, संस्थान के प्रति सभी सक्रिय संस्थान कर्मियों की कटिबद्धता का द्योतक है।

समाजिक दायित्वों के मोर्चे पर संस्थान का विपुल योगदान रहा है। संस्थान द्वारा नियमित रूप से आयोजित किये जाने वाले किसान मेले में बड़ी संख्या में किसानों, उद्यमियों, और महिलाओं ने भाग लिया। इसके अतिरिक्त संस्थान द्वारा समय-समय पर आयोजित किये जाने वाले विभिन्न प्रशिक्षण कार्यक्रमों से लाभान्वित होने वाले कृषकों एवं उद्यमियों से संस्थान की सफलता पुर्नप्रमाणित होती है।

संक्षेप में संस्थान के कार्मिकों और विद्यार्थियों ने इस वर्ष में उत्कृष्ट प्रगति का प्रदर्शन किया है, मैं आशा करता हूँ कि वे इस उत्साह को आने वाले वर्षों में भी बनाये रखेंगे। मैं, आप सभी से 12वीं पंचवर्षीय योजना के प्रथम वर्ष से ही निहित उद्देश्यों की प्राप्ति हेतु उत्कृष्ट प्रयासों की आशा करने के साथ शुभेच्छा की कामना करता हूँ।

राम

प्रोफेसर राम राजशेखरन

From the Director's Desk.....

It's my pleasant duty to present the research highlights of our institute for the year 2011-2012. It has been a very endearing year in terms of research, conferences, publications and extension activities. Since this year marked the closure of the XI FYP projects, it was gratifying to take stock of the success stories that came out of the hard work and relentless efforts of our scientists during the five years of the 11th plan. This also set the stage for constructive deliberation on the projects that need to be undertaken in-house for the 12th plan. Accordingly, we have planned for the continuation of some and closure of a few.

While research on some of CSIR-CIMAP's familiar plants like vetiver, periwinkle, palmarosa, papaver and mentha were intensified, newer plants and newer scientific approaches have been brought to the forefront this year. Use of bioinformatics to identify a successful phytomolecule/its analog in combating certain health issues, or a biochemical and cell based approach to explore the mode of action of these molecules in better understanding their medicinal importance, not only showed improvement in the quality of science performed, but also has confirmed the latent talent and contemporary research skills of our scientific pool one more time! The global litmus test to the quality of science and the innovation involved in research lies in the publication and patent list. We have had close to 100 research publications, many of them in high impact factor journals and 8 patents granted this year. Congratulations to the authors! Besides research, our team was also successful in hoisting two important conferences, viz., the International Symposium on Vetiver in October 2011, and the Society of Biological Chemists (India) Annual conference in November 2011. These successes were only a proof of the dynamic workforce that the institute is blessed with.

On the societal side, our impact has been enormous. The regular Kisan Mela brought in huge numbers of farmers and entrepreneurs who are our direct or indirect beneficiaries. Besides, we have also conducted many successful training programs and workshops for the benefit of farmers, yet another time that our success lies in the household of our farmers.

In short, Team CIMAP, both staff and students have shown excellent progress during this year and I wish and hope the fervor will continue in the years to come. I wish you all good luck as CIMAP steps into the XII FYP period with a hope that the team will put in their best efforts right from the first year to fulfill all the objectives enlisted in the proposals. All the very best!

FYP = Five Year Plan



Prof. Ram Rajasekharan

शोध उपलब्धियाँ - संक्षेप में

लैंगिक और अलैंगिक प्रजनन वाले औषधीय एवं सगन्ध पौधों का अनुवांशिक अध्ययन

स्वचर्तुगुण बन्धय सीमैप खस -40 का विकास

सीएसआईआर-सीमैप के खस घास के अनुवांशिक उन्नयन कार्यक्रम के अन्तर्गत सीमैप खस-40 नाम की स्वचर्तुगुण (4×40) बन्धय का विकास द्विगुण पौध से किया गया। इस किस्म द्वारा वर्ष भर में एक वर्गमी. क्षेत्रफल में लगभग 860 ग्राम कार्बन परिवर्द्ध किया जाता है।

पोस्ता में प्रजनन एवं अभिलक्षण

पोस्ता में होमियाटिक उत्परवर्ती क्लीस्टोगैमस पिस्टलाटा-३ विकसित किया गया जिसमें कि दल पुंज वाह्यदल पुंज में एवं पुंकेसर कारपेलायड्स में परिवर्तित थे और इन पर मेण्डेलियन वंशानुगमन नियंत्रण अप्रभावी था। इस उत्परवर्ती का आणविक स्तर पर अध्ययन प्रगति में है, जिससे इसके अवयवों के क्रमिक विकास एवं नवीन अधिक उत्पादन वाली प्रजाति का विकास सम्भव होगा।

पोस्ता में अनुवांशिक अध्ययन

छः संकर संततियों के विभिन्न वंशों के अध्ययन से ज्ञात हुआ कि पोस्त में बीज उपज, सम्पुट सूचांक और मार्फीन प्रतिशतता के वंशानुगति में प्रभाविता एवं प्रबलता घटक का महत्व योज्य घटक से ज्यादा था।

पामारोजा में बीज निर्धारण

गुणवर्धित बीज एवं बीज दर निर्धारण हेतु अंकुरण प्रतिशत, तापक्रम एवं ओज क्षमता जैसे महत्वपूर्ण मापकों के अध्ययन द्वारा पता चला कि 25°C पर किस्म पीआरसी-1 में अधिक अंकुरण क्षमता तृष्णा एवं तृप्ता में पौध ओज सूचांक 1 और 2 अधिक थे।

मेन्था में अनुवांशिक सुधार

अनुवांशिक सुधार कार्यक्रम के अन्तर्गत अधिक पैदावार देने वाली विभिन्न क्रीमोवर के विकास हेतु मेन्था पिपरेटा से कुल 50 विशिष्ट अर्धसंततियों का बीज द्वारा विकास किया गया।

सदाबहार में अनुवांशिक अध्ययन

सदाबहार में बन्द दलपुंज वाले तथा बौने एवं सामान्य दलपुंज वाले उत्परवर्ती के संकर के F_2 संततियों में से बौनी एवं बन्द दलपुंज वाली रिकाम्बीनेन्ट पौध का बौनी स्वपरागित पौधे के संकर के F_2 में क्लीस्टोगैमस रिकाम्बीनेन्ट (कम बीज वाले) और स्वपरागित लम्बे पौध के संकर के F_2 संतति से अच्छी बीज पैदा करने वाले क्लीस्टोगैमस रिकाम्बीनेन्ट का वरण किया गया।

उत्तर भारतीय दशाओं के लिए पाइरेथ्रम

प्राकृतिक कीटनाशक पाइरेथ्रिन के स्रोत पाइरेथ्रम के फूलों के विशिष्ट भौगोलिक उत्पादन स्थल इसकी उत्पादकता को परिसीमित करने वाले कारक है। देश के आयात को कम और माँग को पूरा करने हेतु संस्थान द्वारा पाइरेथ्रम की एक संकुल किस्म का विकास किया गया।

करकुमा अमाडा का संरक्षण एवं संग्रहण

अव्यवस्थित खेती, अविवेकपूर्ण कटाई/खुदाई और फफूँद संक्रमण के लिए अतिसंवेदनशील होने के कारण *Curcuma amada* के अनुवांशिक संसाधन का संरक्षण अनिवार्य हो गया है। जिसके लिए कृत्रिम बीज प्रविधि का उपयोग करते हुए संक्रमण मुक्त नयाचार विकसित की गई है।

चिकित्सकीय रूप से महत्वपूर्ण नवीन अणुओं का अध्ययन

कर्क रोग रोधी नये अणु

गैलिक एसिड से इनडानोन व्युत्पन्न बेनजीलीडाईन इनडानोन संश्लेषित किया गया, जो गैलिक एसिड की तुलना में बेहतर एण्टी कैंसर गुणों वाला पदार्थ है।

हैलिकोबैक्टर पाइलोरी रोधी आर्टीमिसनिन आर्टीमिसनिक एसिड का विलगन एवं आर्टीमिसनिन व्युत्पन्नो का संश्लेषण

पन्द्रह आर्टीमिसनिन व्युत्पन्न संश्लेषित किये गये जिसमें से आठ नये थे। जैव सक्रियता के लिए परीक्षित किये गये पाँच में से एक व्युत्पन्न “आर्टीसाइक्लोप्रोपाइलमिथर” अत्याधिक जैव-सक्रिय पाया गया।

एलेस्टोनिया में गुणात्मक मापन हेतु एचपीटीएलसी

एलेस्टोनिया स्क्वालेरेनेसिस (सप्तपर्णी) गुणवत्ता नियन्त्रण हेतु कोई भी प्रमाणिक क्रोमेटोग्राफिक विधि उपलब्ध नहीं है। इसके उपयोगी अवयवों, उर्सोलिक अम्ल, बेटूलिनिक अम्ल, वीटा-साइटोस्टिराल और ल्यूपियाल के मात्रात्मक एवं गुणात्मक मापन हेतु एक प्रभावी HPTLC विधि विकसित की गयी।

अमानिया मल्टीफ्लोरा से नये जैव सक्रिय अणु

अमानिया मल्टीफ्लोरा के रासायनिक विश्लेषण से एक नवीन और नौ पूर्व ज्ञात औषधीय गुणयुक्त यौगिकों की पहचान हुई। इसका मेथेनाल सत् और यौगिक 1, नैलिडिक्सिक अम्ल की न्यूनतम जीवरोधक क्षमता (MIC) में चार गुना तथा अन्य यौगिक और उसके व्युत्पन्न (IA-IE) दो गुना की कमी लाते हैं। नवीन यौगिक (5) औसत दर्जे की इनविट्रो क्षय रोग रोधक क्षमता (MIC=25 Mg/ml) प्रदर्शित करता है।

मनोरोग रोधी क्रियाशीलता निर्धारण हेतु विधि

यौगिक α योहम्बिन महत्वपूर्ण मनोरोग रोधक क्रिया प्रदर्शित करता है। इसके आभासी

व्युत्पन्नो की संभावित मनोरोग रोधक क्षमता को मापने का एक विधिमान्य सांख्यिकीय-संरचना-क्रियाशीलता-सम्बन्ध (QSAR) माडल विकसित किया गया।

राउल्फिया टेट्राफाइला की पत्तियों से मनोरोगरोधक क्षाराभों का एचपीएलसी द्वारा गुणात्मक मापन

राउल्फिया टेट्राफाइला की पत्तियों के सत् और सत् के विभिन्न भागों में महत्वपूर्ण मनोरोग रोधक अवयवों α योहम्बिन, आइसोरेसरपिलिन और 10-मेथक्सीटेट्राहाइड्रो एलोस्टोनिन के गुणात्मक एवं मात्रात्मक मापन हेतु एक विधिमान्य HPLC विधि विकसित की गयी।

व्यावसायिक रूप से महत्वपूर्ण औषधीय एवं सगन्ध पौधे में चयापचय पथिकाओं का अध्ययन

विथानोलायड पाथवे में वर्की अनुक्रमणकारक का प्रभाव

अश्वगंधा में वर्की (WRKY) 131, 336, 288 और 5 के mRNA अभिव्यक्ति द्वारा पता चला है, कि वे मिथाईल जैसेमोनेट, (जो कि विथानोलायड पाथवे का उत्प्रेरक है) को सकारात्मक रूप से प्रभावित करते हैं। अश्वगंधा के पौधों से विलगीत PDS जीन को वेक्टर pTRV2 और pYL156 में प्रारूपित कर एग्रोबैक्टीरियम के माध्यम द्वारा पुनः अश्वगंधा पौधे को संक्रमित कराने पर, संक्रमण के 15 से 20 दिन बाद PDS द्वारा जीन मौनीकरण अभिव्यक्त हुआ।

सदाबहार में जीन अनुक्रमण नियामक का विवरण

सदाबहार पौधे में द्वितीयक चयोपचयी पथिका जीनों का कुशलतापूर्वक नियमन करने हेतु एक LIM अनुक्रमणकारक का विलगन एवं प्रतिरूप किया गया। सदाबहार पौधे में द्वितीयक चयोपचयी पथिकाओं के नियमन में इसकी भूमिका को समझने के लिए पादप द्वितीयक वाहकों में अधिअभिव्यक्ति एवं अस्थायी मौनीकरण द्वारा सदाबहार में

टरपिनॉयड इन्डोल अल्कलायड (TIA) पथिका के मुख्य जीनों का अधिनियमन इंगित हुआ।

गुलेबबूना के विसाबोलीन जीन का प्रारूपण और अभिलक्षण

गुले बबूना के पुष्प से निष्कर्षित cDNA का विनष्ट प्राइमर क्रम का उपयोग कर जीन के दो भागों का परिवर्धन, जेल शुद्धिकरण, pGEM वेक्टर में प्ररूपण और BLASTx विवेचन द्वारा उनकी pVC57 में सैटलम स्पीशीज के मोनोटरपीन सिन्थेज किण्व से क्रमशः 94 एवं 70 प्रतिशत समानता प्रदर्शित हुई।

इन टुकड़ों के 3' और 5' रेस से परिवर्धन pVC57 प्रारूपण और BLASTx विवेचन द्वारा उनकी सैटलम एस्ट्रोकेलेडोनियम के विसाबोलीन सिन्थेज किण्व के साथ 93 प्रतिशत समानता प्रदर्शित हुई।

टैजिटस इरेक्टा में पुनर्जीवन अध्ययन

टैजिटस इरेक्टा के विभिन्न अंगों जैसे कि बीजपत्र, बीजपत्राधार और प्राक्ष (Rachis) इत्यादि के ऊतकों को विभिन्न पादप ऊतक संवर्धन माध्यमों में सर्वर्धित कर उनसे प्ररोह पृथक्त्व का नयाचार विकसित किया गया।

जैविक और अजैविक उद्दीपन द्वारा मंडूकपर्णी में सेन्टेलोसाईड में वृद्धि

मंडूकपर्णी के ऊतक संवर्धन माध्यम में, ऊतक के बहुशाखीय वाली अवस्था में, Cu⁺⁺ और ट्राइकोडर्मा मिलाने पर ऊतक वृद्धि सूचांक (767) और सेन्टेलोसाईड उत्पाद (0.381) पाया गया।

बेन्जाइल आइसोक्विलीन अल्कलायड पाथवे एन्जाइमों के लिए इन-सिलिको सिंटेनी मैप का विकास

आणविक स्तर पर जैव संबंधित पदों के अन्वेषण के प्रयास द्वारा कुल 15,279 विशिष्ट ट्रॉसक्रिप्ट, जिसमें 1408 कन्टीग और 13,871 सिंग्लटन शामिल हैं, पहचाने गये। इन ट्रॉसक्रिप्ट के विश्लेषण के पश्चात् मुख्य रूप से काल्पनिक जीन एवं इसके

अतिरिक्त पाथवे से संबंधित महत्वपूर्ण जीन प्रकाश में आये। ईएसटी डाटासेट का यह कार्यात्मक एनोटेशन वर्गीकरण, आणविक प्रजनन, आनुवंशिकी, जीनेमिक्स और द्वितीयक चयापचय के अध्ययन के लिए एक उपयोगी संसाधन सिद्ध होगा।

तुलसी तथा मेंथा के द्वितीयक उपायचयन प्रोटीनों की संरचना एवं कार्यात्मक अभिलक्षण का निर्धारण

तुलसी तथा मेंथा के द्वितीयक उपायचयन प्रोटीनों का इन-सिलिको की विधि से संरचना निर्धारण तथा कार्यात्मक अभिलक्षण किया गया। इनमें प्रमुख प्रोटीन युजीनॉल-ओ-मिथाइल ट्रॉसफरेज तथा चैवीकाल-ओ-मिथाइल ट्रॉसफरेज हैं। इन प्रोटीन प्रतिरूपों का उपयोग इनके विभिन्न कार्यों के विश्लेषण के लिये किया जा सकता है।

हर्बल उत्पादों हेतु विश्वस्तरीय गुणवत्ता मानकों का निर्धारण

शालपर्णी में गुणवत्ता मापन हेतु एचपीएलसी-पीडीए विधि का विकास

शालपर्णी आयुर्वेदिक औषधि दशमूल का एक महत्वपूर्ण घटक है। पौधे की गुणवत्ता निर्धारण हेतु पौधे से निकाले गये तीन महत्वपूर्ण फ्लेवोनोयड पर आधारित एक एच. पी.एल.सी. विधि का प्रतिपादन किया गया।

सम्भालू में मुख्य इरिडोवायड्स और एण्टी आक्सीडेंट के मापन हेतु एच.पी.एल.सी. विधि

सम्भालू एक महत्वपूर्ण भारतीय औषधीय पौधा है। पौधे से महत्वपूर्ण एंटीआक्सीडेंट इरिडोवायड्स निकाले गये एवं इनके आधार पर पौधे की गुणवत्ता निर्धारण हेतु एच. पी.एल.सी. विधि का प्रतिपादन किया गया।

सम्भालू में फ्लैवानाइड्स एवं बैन्जाइक एसिड व्युत्पन्नों के मापन हेतु एचपीएलसी विधि

पौधे की गुणवत्ता निर्धारण हेतु फ्लैवानाइड्स एवं बैन्जाइक एसिड डेरिवेटिव्स को

केमिकल मार्कर लेते हुए एक अन्य एचपीटीएलसी विधि द्वारा प्रतिपादन किया गया।

अग्निमंथ का रासायनिक परीक्षण

अग्निमंथ आयुर्वेदिक औषधि दशमूल का एक महत्वपूर्ण घटक है। पौधे के तने की छाल से ग्यारह महत्वपूर्ण एंटीआक्सीडेंट रसायन विलिप्त किये गये जिसमें से दो रसायन प्रकृति में पहली बार पाये गये।

करकुमा अमाडा में क्षयरोग रोधक तत्व विश्लेषण हेतु आरपीएलसी-पीडीए-एमएस विधि

Mango ginger एशिया में पारम्परिक तथा लोक चिकित्सा प्रणाली में प्रयोग होता है। क्षयनाशक लैबडेन डाइटरपीन एल्डीहाइड (labda-8 (17), 12-diene-15-16-dial) के पृथक्करण एवं संरचना व्याख्या के बाद *C. amada* में Quantify करने के लिए एक नयी मान्य HPLC-PDA पद्धति स्थापित की गयी।

तुलसी में सुरक्षा प्रोफाइल निर्धारण हेतु एचपीएलसी फ्रिंजर प्रिन्ट का विकास

तुलसी के औषधीय गुण की सुरक्षा को परिभाषित करने के लिए Chromatographic fingerprint पद्धति को विकसित किया गया, जिसमें तीन मानकीकरण अर्क की fingerprint विधि और *In-vivo* औषधीय सुरक्षा रेखाचित्र के साथ उनकी चोटियों (Peaks) में पारस्परिक संबंध का विवरण दिया है।

अप्रयोज्य कम उर्वर मृदाओं में उच्च उपयोगी कृषि पद्धतियाँ

केवांच बीज उत्पादन क्षमता पर विभिन्न छाया स्तरों का प्रभाव

विभिन्न छाया स्तरों पर केवांच के बीज उत्पादन क्षमता के अध्ययन से पता चला कि 50% छाया की दशा में केवांच (10.69/हे) बीज उत्पादन क्षमता बिना छाया और 75% छाया की दशा की तुलना में ज्यादा है।

गेहूँ और खस की सहफसली खेती की सम्भावना

गेहूँ और खस की सहखेती में गेहूँ की पौध संख्या 25 और 50 प्रतिशत से घटाने पर ऊपज में क्रमशः 11 और 21 प्रतिशत की कमी आई परन्तु खस के उत्पादन पर बगैर किसी प्रभाव के प्रति हे. 22-27 किग्रा. तेल प्राप्त हुआ जो कि गेहूँ उत्पादन की कमी की भी पूर्ति करता है।

आँवला के बागानों में खस की सहखेती

खस को आँवले के बागों में 30 x 30 सेमी पंक्ति से पंक्ति और पौध से पौध की दूरी रख और 80:40:40 किग्रा./हे. की दर से ऊर्वरक के प्रयोग करने पर 15.5 किग्रा./हे. तेल उपज प्राप्त की गई जो कि अप्रयुक्त क्षेत्र का बेहतर उपयोग है।

अश्वगन्धा में गीले सड़न रोग का एकीकृत प्रबन्धन

अश्वगन्धा के गीले सड़न रोग के कारक को संवर्द्धन, आकार-प्रकार और आणविक विशेषताओं के आधार पर फोएनोफोरम कुकुरविटेरम के रूप में पहचाना गया तथा NCBI जीन बैंक के अनुक्रम न. JN639861 पर जमा है।

स्टीविया में छोटी पत्ती रोग का एकीकृत प्रबन्धन

स्टीविया में छोटी पत्तियों के रोग के कारक को संचरण इलेक्ट्रान सूक्ष्मदर्शी से अध्ययन कर फाइटोप्लाज्मा प्रमाणित किया गया जो कि ज्वार के बंची शूट (16SrXXIV) फाइटोप्लाज्मा (AF509322) से 98.2% समानता दर्शाता है।

औषधीय एवं सगन्ध पौधों की सूक्ष्मजीवियों के मध्यवर्तन से उपज एवं प्रतिबल उत्प्रेरित क्षति में सुधार

IAA उत्पादक पैन्टोइमा स्पीशीज और ग्लोमस एग्रीगेटम जैसे सूक्ष्मजीवी से जिरेनियम की कटिंग को पौधशाला में उपचारित करने पर तेल ऊपज में बढोत्तरी होती है।

लवणरोधक पौध वृद्धि उत्प्रेरक हैलोमोनास डेसिडेरटा (STR8) और इक्सीगओ वैक्टीरियम आक्सीडोटोलेरैन्स (STR36) जापानी पोदीने को 300 mm नमक के प्रतिबल के प्रति सहनशीलता प्रदान करता है। एक्रोमोबैक्टर जाइलोसावसी डैन्स (Fd2) और ओक्रोमोबैक्टरम राइजोस्फेरी (Oci13) से जलभराव वाली दशाओं में तुलसी की वृद्धि में सुधार पाया गया। माइक्रोवैक्टीरियम स्पीशीज (Sucr 140) क्रोमियम की मात्रा में 24 घण्टे में कमी लाता है।

अश्वगन्धा की जड़ों से जलाल्कोहलिक सत्व की एण्टीएजिंग और प्रतिबल रोधी क्षमता का सी. एलीगैन्स द्वारा प्रदर्शन

अश्वगन्धा की जड़ों के जलाल्कोहलिक सत्व से सी. इलीगैन्स के जीवन काल में लगभग 14 प्रतिशत की वृद्धि के साथ फ्री रेडिकल्स के स्तर में कमी आई। विभिन्न उत्परिवर्तियों और जलाल्कोहलिक सत्व की प्रभावी सान्द्रता के प्रयोगों द्वारा जीवन काल वृद्धि प्रक्रिया अध्ययन से पता चला कि अश्वगन्धा सत्व उत्परिवर्ती cIk1 द्वारा जीवनकाल को विभिन्न रूप से प्रभावित करता है।

खस जड़ खनन यंत्र का प्रक्षेत्र परीक्षण और प्रदर्शन

टैक्टर (25 BHP) चालित विकसित यंत्र से एक हे. क्षेत्र की खुदाई लगभग 20 घण्टे में 10,000 रुपये की लागत से हो जाती है जो कि पारम्परिक मानव श्रम की तुलना में चार गुना अधिक लाभकारी है।

औषधीय एवं सगन्ध पौध विज्ञान में मौलिक अनुसंधान

महत्वपूर्ण औषधीय पौधों का रासायनिक परीक्षण

अशोक वृक्ष की छाल से कई महत्वपूर्ण अवयवों को निष्कर्षित किया गया है जिनमें से कुछ यौगिकों ने जैवीय गुण प्रदर्शित किया है। जैथोजाइलम की दो स्पेसीज के निष्कर्षण से नई तरह की एल्केलवायडस प्राप्त हुई है। इनमें से कुछ कैंसर रोधक

क्षमता से परिपूर्ण है। अश्वगन्धा की स्टीरवायडस से रासायनिक प्रक्रिया द्वारा अनेक यौगिक बनाए गए हैं। इनकी गुणवत्ता का परीक्षण कैंसर रोधी के रूप में किया जा रहा है।

औषधीय एवं सगन्ध पौधों द्वारा मलेरिया रोधण

औषधीय एवं सगन्ध पौधों से मलेरिया नियंत्रण

परजीवी अवरोधन, वाहक नियंत्रण, आर्टीमीशिया पौधों में आर्टीमीसिनिन घटक की मात्रा में वृद्धि (आनुवांशिक उन्नयन) तथा लक्ष्य (DMI target) की पहचान के लिए इन-सिलिको इत्यादि समग्र विधियों के प्रयोग से प्रभावी मलेरिया नियंत्रण हेतु अनुसंधान किये गये।

व्यावसायिक रूप से महत्वपूर्ण जैव संसाधनों का अनुशीलन

एमानिया बैक्सीफेरा में क्षय रोग रोध क्रियाशीलता की खोज

एमानिया बैक्सीफेरा से निष्कर्षित, यौगिक ४ हाइड्राक्सी-ए-टेट्राएलोन और उससे संश्लेषित दो व्युत्पन्नो में क्षयरोग रोधी क्रियाशीलता पाई गयी।

पौध जन्य अणुओं द्वारा विषाणु वर्हिवाहक पम्प का प्रभाव अपरिवर्तन

तीन नवीन विकसित पौध जन्य अणुओं CIMAP-LYS, CIMAP-GA और CIMAP-NDA द्वारा वर्हिवाहक पम्प नियंत्रक जीन के नियमन के अपरिवर्तन द्वारा विषाणुरोधी एण्टीबायोटिक की सान्द्रता को 9६ गुना तक कम कर दिया।

प्रमाणीकृत हर्बल आफ्टर शेव जेल का विकास

पौधजन्य प्राकृतिक घटकों का उपयोग कर एक After Shave Gel तैयार किया गया है। यह जेल “सिम-1116” हानिकारक जीवाणुओं का नाश करता है एवं “एलोवेरा” और “ग्लिसरीन” त्वचा की नमी को संतुलित कर तरो-ताजा बनाये रखने में मदद करता है।

उसनिक एसिड की विषाणुरोधी क्रिया का स्टैफाइलो कोकस आरस की झिल्ली विदीर्णन द्वारा प्रदर्शन

उसनिक एसिड की 25-50µg/ml की सान्द्रता द्वारा मेथीसीलिन रोधी स्टैफैलोकोकस आरस की वृद्धि को अवरोधित किया।

करकुमिन और उसके व्युत्पन्नों की मलेरियारोधी क्षमता

करकुमिन, डिमेथाक्सीकरकुमिन और बिसडिमेथाक्सी करकुमिन को 100 mg/kg शारीरिक भार की दर से तथा क्लोरोफिन के 10mg/kg शारीरिक भार की दर से प्लाजमोडियम बरजनी (K-173) द्वारा संक्रमित स्विस एल्बिनो चूहों पर तुलनात्मक अध्ययन किया गया।

पुल्चिया लैंसोलाटा से विग्लित पी-53 और पी-74 का सी 6 ग्लोओमा कोशाओं में शोथरोधिता का अध्ययन

पुल्चिया लैंसोलाटा से निष्कर्षित P-53 और P-74 की 1,10 और 100µg/ml द्वारा पूर्व उपचारित चूहों की सी-6 ग्लोओमा कोशाओं को 0.1µg/ml LPS द्वारा शोथ उद्दीपित करने पर पूर्व उपचारित कोशाओं में शोथ मध्यस्थों की मात्रा में दर अनुरूप कमी पायी गयी।

IND-M की विषाक्तता का स्विस एल्बिनो चूहों में अध्ययन

IND-M को औषधीय उत्पाद रूप में चिन्हित करने से पूर्व इसकी कर्करोगरोधक क्रियाशीलता का इन विट्रो माध्यम में विषाक्तता का आकलन किया गया।

सहजन में उपस्थित जैव सक्रियता का प्रायोगिक निरूपण

आक्सी उद्दीपित शिथिलता के लक्षण को सहजन की पत्तियों के विभिन्न प्रभावी सान्द्रता के जलीय सत्व द्वारा GSH में वृद्धि और MDA स्तर में कमी द्वारा प्रभावित पाया गया, जबकि बीजों के इथेनालिक सत्व में अत्यधिक फेनाल, अवकरण शक्ति

एवं फ्री रेडिकल्स को निस्तारित करने की क्षमता पायी गई।

औषधीय एवं सगंध पौधों के आसवित अवशिष्ट से जैव ईंधन, जैव बहुलक, जैव कीटनाशक एवं अन्य उपयोगी रसायन

भारत में प्रतिवर्ष औषधीय एवं सगंध पौध कृषकों द्वारा लगभग 6 लाख टन आसवन अपशिष्ट पैदा किया जाता है। जिसका ज्यादातर भाग बेकार हो जाता है। सीएसआईआर-सीमैप ने अपने शोध कार्यों से इस अपशिष्ट का प्रयोग कर मूल्यवान जैव रसायन उत्पाद तैयार किये हैं।

विश्लेषण पद्धतियों का विकास

प्लाजमा में एण्टी बायोटिक के मापन हेतु त्वरित एवं अघातक विधि का विकास

FTNIR के माध्यम से प्लाजमा में उपस्थित/उपलब्ध एण्टी बायोटिक की मात्रा निर्धारण हेतु त्वरित एवं गैर विनाशकारी विधि विकसित की गई जिसका उपयोग पौध जन्य जैव सक्रिय पदार्थों के फार्माकोकैमिस्ट्रिक के अध्ययन में भी किया जा सकता है।

कपूर तेल में कैम्फर इन्नाशियोमर की काइरेल्टी का अध्ययन

कपूर के सगंध तेल में उपस्थित कैम्फर इन्नाशियोमर्स की काइरेल्टी का अध्ययन वर्ष के बारह महीनों में करने पर ज्ञात हुआ कि (IR) - (+) - एवं (IS) - (-) - इन्नाशियोमेरिक अनुपात 99:1 था, जो कि संश्लेषित कैम्फर से भिन्न है।

औषधीय एवं सगंध पौधों का सर्वेक्षण, सूचीकरण एवं तकनीकी प्रसार

मेंथॉल मिन्ट खेती में आर्थिक विश्लेषण पर लागत और लाभ की तुलना की दृष्टि से एक अध्ययन किया गया। मेंथाल मिन्ट की एक हेक्टेयर खेती में औसत लागत रु. 15,966/- प्रति हेक्टेयर आती है, तथा कुल शुद्ध आय रु. 40,649/- प्रति हेक्टेयर प्राप्त होती है। उत्पादन पर मानव श्रम, मशीनरी, खाद एवं उर्वरक, सिचाई और निराई-गुड़ाई कार्यों इत्यादि कारकों का सीधा प्रभाव रहा है।

सी.एस.आई.आर.-सीमैप किसान मेला 31 जनवरी 2012 को लखनऊ में आयोजित किया गया जिसमें देश के विभिन्न भागों से 1500 से अधिक किसानों, महिलाओं तथा उद्यमियों ने भाग लिया। इस अवसर पर दो कम्पनियों (मेसर्स इमामी बायोटेक लिमिटेड कोलकाता एवं मेसर्स इफ्का लैब रतलाम) से परामर्श कराया गया।

सगंध तेलों की प्रोसेसिंग विषय पर उद्यमिता प्रशिक्षण, एलोवेरा प्रोसेसिंग पर चार दिवसीय उद्यमिता प्रसंस्करण प्रशिक्षण, उत्तराखण्ड के लिए उपयुक्त औषधीय एवं सगंध पौधों को उगाने एवं प्रसंस्करण पर प्रशिक्षण कार्यक्रमों का आयोजन किया गया जिसमें कुल लगभग 140 प्रतिभागियों ने हिस्सा लिया। दो महिला उद्यमिता प्रशिक्षण कार्यक्रम लखनऊ में आयोजित किये गये जिसमें लगभग 34 महिला प्रतिभागियों ने प्रशिक्षण प्राप्त किया। देश के विभिन्न राज्यों में 16 प्रशिक्षण कार्यक्रम आयोजित किये गये जिसमें देश के विभिन्न राज्यों से लगभग 790 प्रतिभागी किसानों व उद्यमियों ने प्रशिक्षण प्राप्त किया। राठ हमीरपुर, उत्तर प्रदेश में आर्गेनिक तुलसी उगाने वाले लगभग 300 किसानों का डाटा एकत्रित कर एक आर्थिक अध्ययन किया गया तथा बुन्देलखण्ड के लगभग 2 दर्जन किसानों के खेतों का मृदा परीक्षण कर माइक्रोबियल बायोजैविक तथा नत्रजन, फास्फोरस, पोटाश एवं सूक्ष्म तत्वों के बारे में अध्ययन किया गया तथा औषधीय एवं सगंध पौधों की खेती करने की संस्तुति प्रदान की गयी।

सीमैप शोध केन्द्र पन्तनगर

जटामांसी के संगंध तेल में रसायनिक भिन्नता

उत्तराखण्ड में प्राकृतिक रूप से उगने वाली 17 विभिन्न जटामांसी के संगंध तेल नमूनों का अध्ययन तेल प्रतिशतता एवं गुणवत्ता की भिन्नता और समानता के आधार पर कर उन्हें कुल 6 समूहों में व्यवस्थित किया गया। पचौली अल्कोहल (13.4-66.7%) α -बलनीशीन (<0.05-23.5%), α -गुआइन (0.2-13.5%), गुआइल (<0.05-12.2%) तेल के प्रमुख घटक थे।

जटामांसी की जड़ और तने से प्राप्त संगंध तेल का तुलनात्मक अध्ययन

पचौली अल्कोहल, विरीडीफ्लोराल और आइसोवैलेरिक एसिड तने से प्राप्त तेल में प्रमुख घटक थे, जबकि अल्फा बलनीशीन, अल्फा-गुआइन, सिचैलीन, अल्फा-पचौलीन इत्यादि जड़ उत्पादित तेल के प्रमुख घटक थे।

पचौली और जटामांसी के संगंध तेल का तुलनात्मक अध्ययन

दोनों भिन्न पौधों से प्राप्त होने वाले संगंध तेल में 78.5-90.3% तक की समानता पायी गयी। पचौली तेल के आंशिक घटक पोगोस्टोन, पोगोस्टाल और (2)-थूजोपसीन मार्कर चिन्ह है जबकि जटामांसी में ३-मिथाईल वैलेरिक एसिड थाईमाल, मिथाईल ईथर, कारवोकालमिथाईल ईथर, बॉनाइल एसिडेट, कसाने, मालीओल इत्यादि मार्कर चिन्ह है।

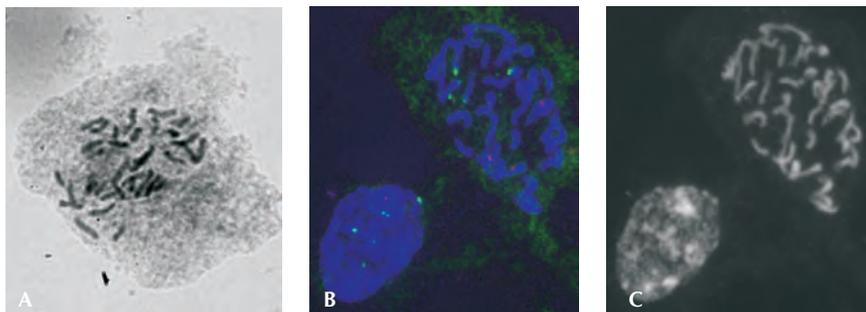
Development of a novel autotetraploid clone 'CIMAP-Khus 40' of Vetiver (*Vetiveria zizanioides*) useful for carbon sequestration and soil conservation

Input : UC Lavania

Taking further CSIR-CIMAP's 'Vetiver Grass Model' (*Current Science* 97:618-619, 2009), a seed infertile autotetraploid clone of *Vetiveria zizanioides* suitable for ecological plantations for long-term carbon sequestration in subsoil horizons has been developed from a pre-selected low fertility diploid clone. The developed clone is capable of producing one kg of dry root biomass (of which 43% is carbon content) after six months from one square meter area with single slips planted at 50 cm x 40 cm with an estimated carbon sequestration potential of 860 g / square m / year. The clone 'CIMAP-Khus 40' is characterized by somatic chromosome no. $4x = 40$, larger stomata, fast growing deep penetrating roots, and seed infertility disabling its spread as a weed. This clone has unique ISSR and RAPD profile that serve as DNA fingerprints (Figs 1-3).



Fig 1: Exo-morphology of the developed polyploid clone 'CIMAP-Khus 40'. A. Root pattern; B-Late flowering and fast growth in the polyploid clone (left) compared to south Indian clone (right); C-The autotetraploid clone showing plant growth and shoot-root ratio at three month growth stage.



A. Somatic chromosomes = 40 of autotetraploid clone; B. rDNA FISH: red 5S green 45 S; C. DAPI stain



DNA fingerprints of clone 'CIMAP-KHUS 40'

D. ISSR Markers :

Lane M : ϕ DNA / Hind III digest

- Lane 1 : UBC807- AGAGAGAGAGAGAGAGT
- Lane 2 : UBC810- GAGAGAGAGAGAGAGAT
- Lane 3 : UBC811- GAGAGAGAGAGAGAGAC
- Lane 4 : UBC812- GAGAGAGAGAGAGAGAA
- Lane 5 : UBC814- CTCTCTCTCTCTCTA
- Lane 6 : UBC818- CACACACACACACACAG
- Lane 7 : UBC823- TCTCTCTCTCTCTCC
- Lane 8 : UBC825- ACACACACACACACT
- Lane 9 : UBC826- ACACACACACACACC
- Lane 10 : UBC828 -TGTGTGTGTGTGTGA



E. RAPD Markers :

Lane M : ϕ DNA / Hind III digest

- Lane 1 : OPJ 6- TCGTTCGCA
- Lane 2 :OPJ 9 - TGAGCCTCAC
- Lane 3 : OPJ10- AAGCCCGAGG
- Lane 4 :OPJ12 - GTCCCGTGGT
- Lane 5 :OPJ13 - CCCACTACC
- Lane 6 : OPJ14- CACCCGGATG
- Lane 7 :OPJ15 - TGTAGCAGGG
- Lane 8 : OPJ16- CTGCTTAGGG
- Lane 9 :OPJ17- ACGCCAGTTC
- Lane 10 :OPJ18- TGGTCGCAGA

Fig 2 : Somatic chromosomes, rDNA localization and DNA fingerprints of of polyploid clone

US Patent No. US 2012/0278945

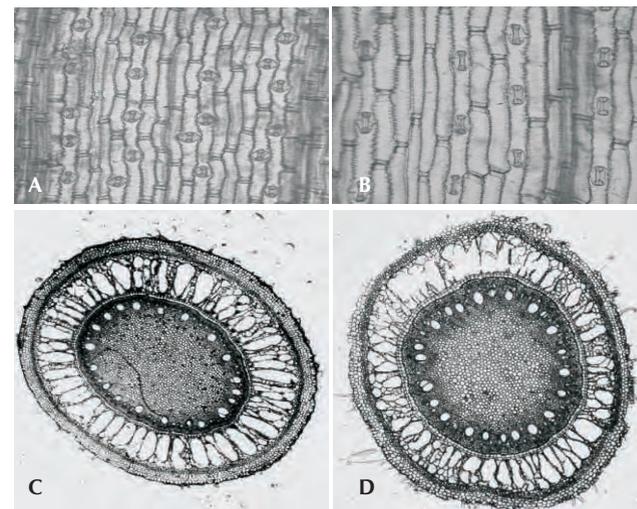
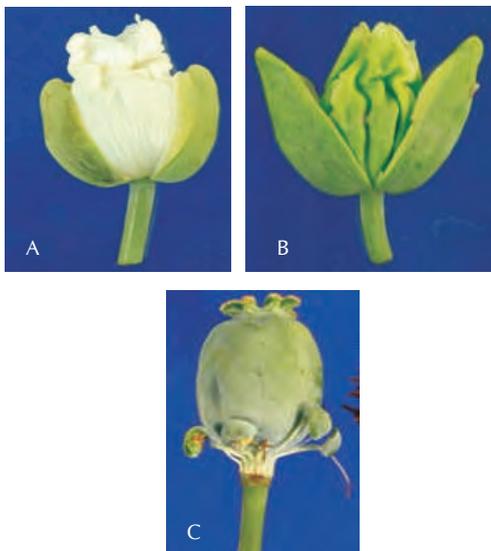


Fig 3. Leaf stomata and TS of root in the diploid (A,C) and autopolyploid (B,D). Note enlarged size of stomata and vascular cylinder in polyploid.

Activity : Breeding and characterization of opium poppy

Input : OP Dhawan

B. function homeotic mutant *Cleistogamous pistillata-3*, with all four petals modified into sepals and stamens into carpeloids has been developed. The genetic studies indicated single recessive nuclear gene control. Molecular studies are being carried out for physical and functional characterization of the mutations in *pistillata* (PI) and *apetalla* (AP-3) genes. The traits like cleistogamy, early flowering and dwarf height of the PI-3 mutant are important economic traits. Other agronomical traits including chemical composition of different alkaloids are not affected. The mutant would be extremely useful for developmental studies and crop improvement in *Papaver somniferum*.



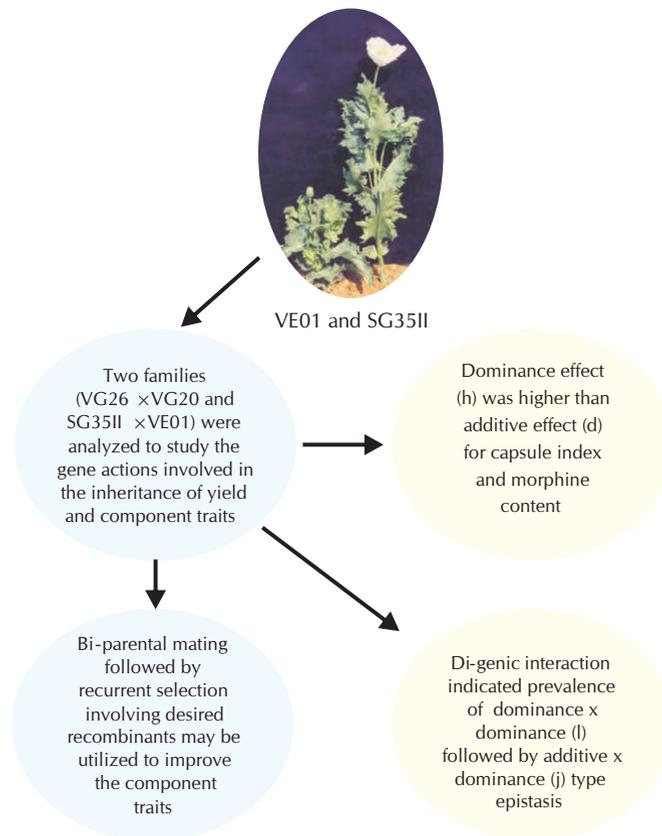
Normal flower organs are shown in (A)

B. function homeotic mutant *Cleistogamous pistillata-3* (PI-3), with all four petals modified into sepals (B) and stamens into carpeloids (C).

Activity : Genetic studies in *Papaver somniferum*

Input : Birendra Kumar

Inheritance of yield and its attributes were worked out applying digenic model through generation mean analysis in opium poppy.

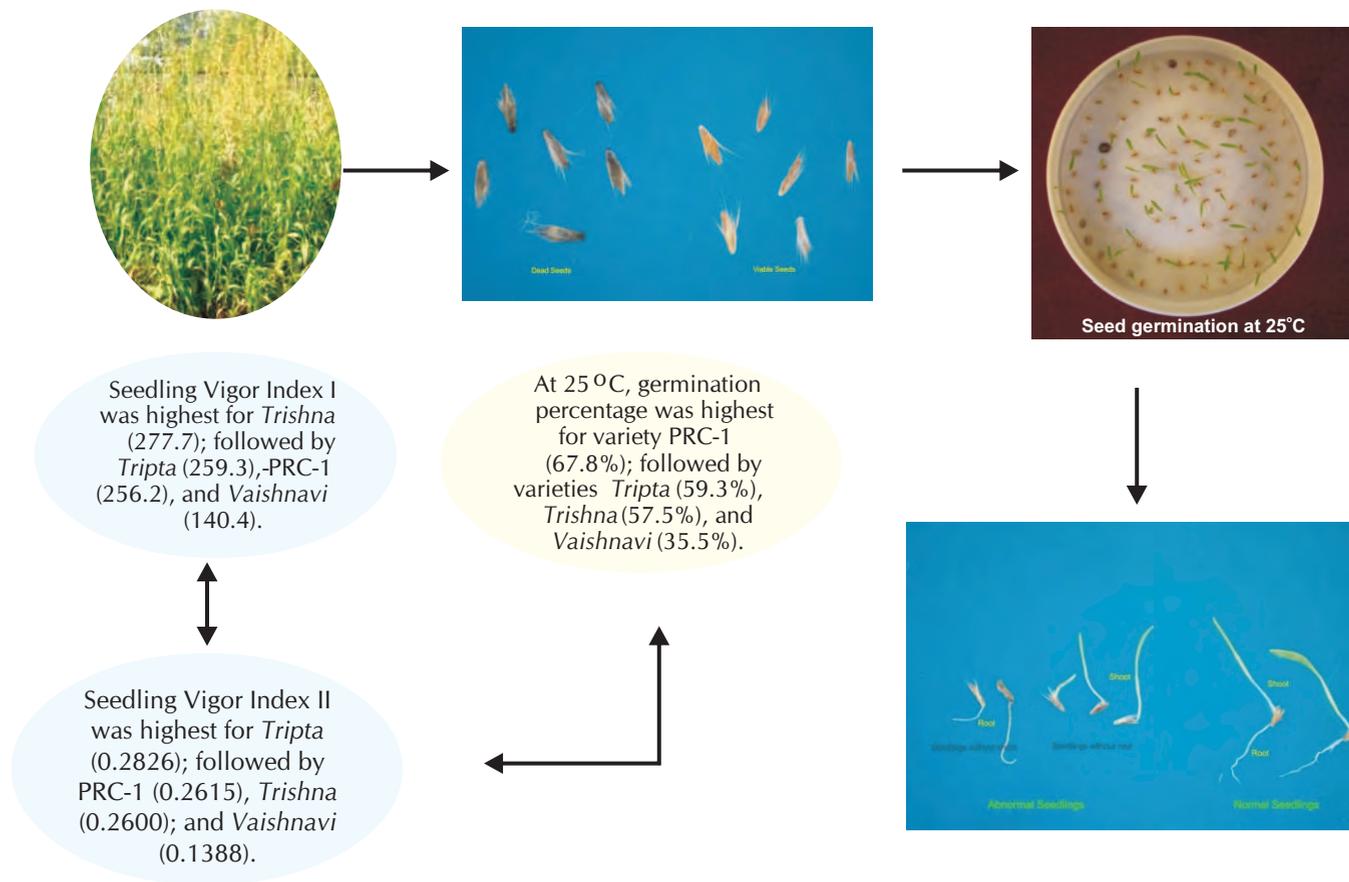


Industrial Crops & Products 36 (1): 445-448, 2012 (IF 2.507)

Activity : Optimization of seed rate for palmarosa

Input : Birendra Kumar

Standard seed germination influencing parameters viz., germination percentage, temperature and vigour index were worked out to optimize the seed rate for palmarora.

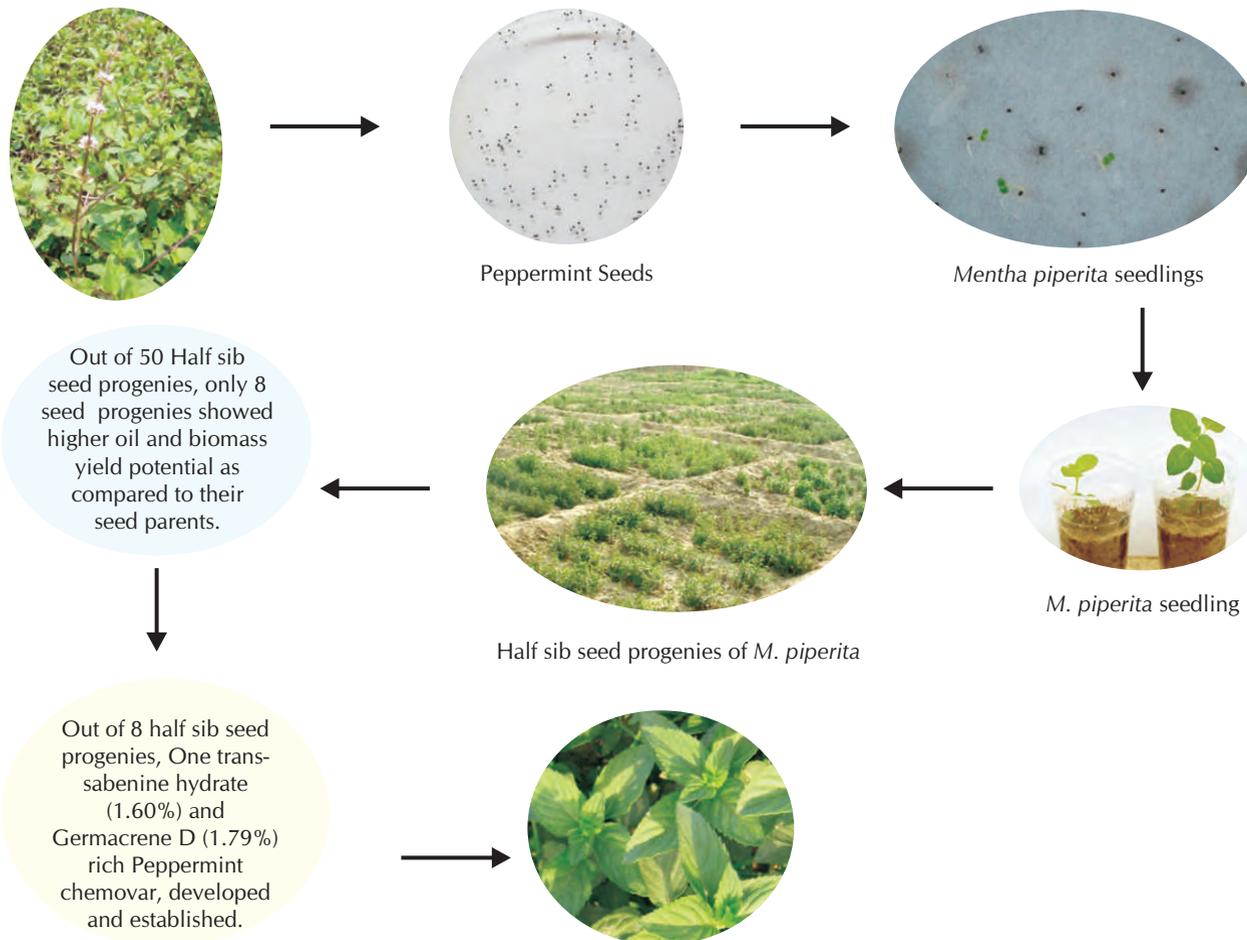


Journal of Crop Improvement 26 (6) : 791-801, 2012

Activity : Breeding and characterization of *Mentha* species : Genetic improvement in *Mentha piperita*

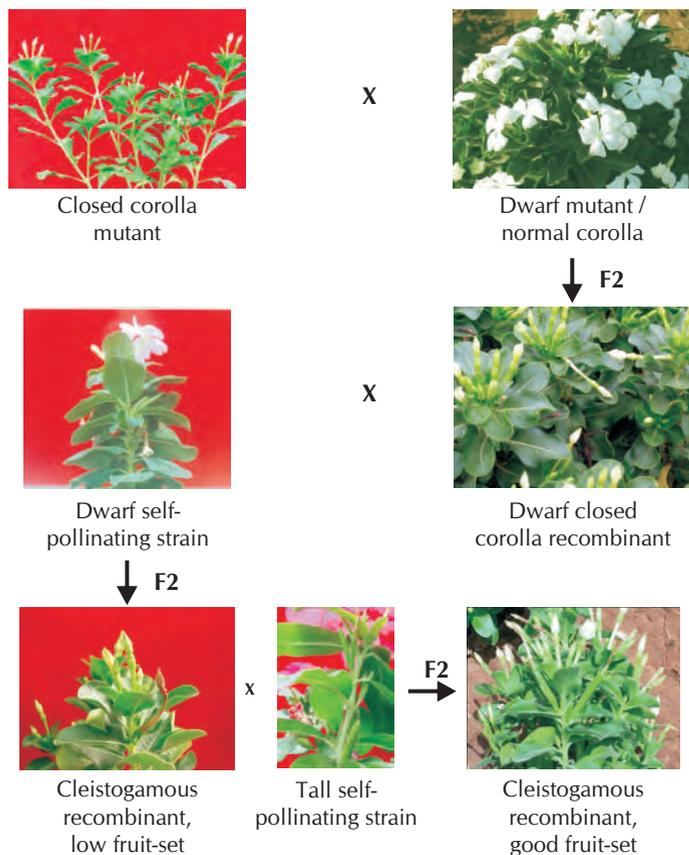
Input : Birendra Kumar

Development of *M. piperita* chemovars through raising the half-sib seed progenies.



Activity : Genetic studies in periwinkle (*Catharanthus*)

Input : RN Kulkarni



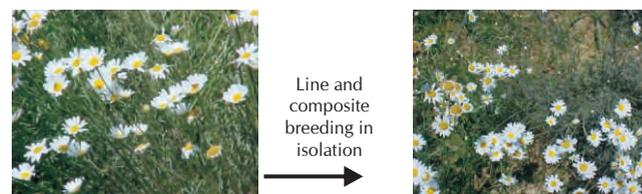
Development of cleistogamy in periwinkle

J. Heredity DOI : 10.1093/jhered/ess077, 2012

Activity : Pyrethrum (*Chrysanthemum cinerariifolium*) for north Indian plains

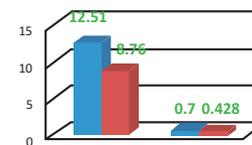
Input : RK Lal

Pyrethrum flowers are the natural source of the safe insecticide pyrethrins. There is continuous increase in consumptions as well as global demand, while their distribution is limited due to specific agro-climatic requirements. Therefore, a genetic improvement program was initiated for a high yielding composite strain.



A self - incompatible plant (Base population)
Pyrethrins - 0.428%

Composite 0 with
Pyrethrins 0.533%



Dry flowers yield and total pyrethrins (%) in Composite-1

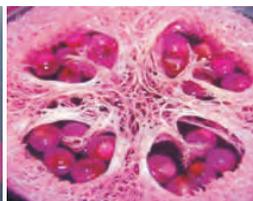
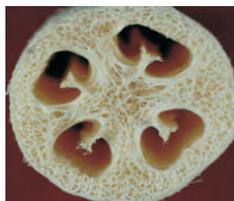


Composite - 1 with pyrethrins 0.70% 12ql/ha dry flowers v/s 8.76 ql/ha in Avadh

Activity : Conservation and storage of *Curcuma amada* on *Luffa* sponge matrix

Input : Suchitra Banerjee and Laiq-ur-Rahman

Imprudent exploitation, unsystematic cultivation practices and vulnerability towards fungal infections necessitated conservation of genetic resources of *C. amada*.



Utilized the multifarious properties of *Luffa* sponge as a novel matrix for synthetic seed mediated conservation of contamination free germplasm.

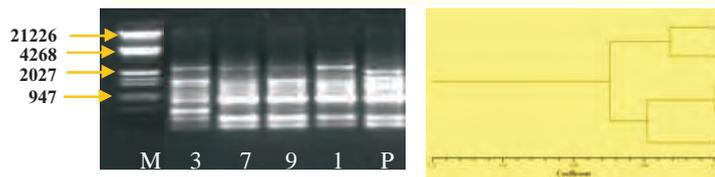
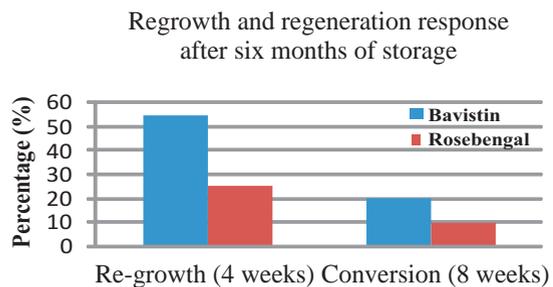
Evaluated the effects of bavistin and rosebengal, on regrowth and plant-conversion frequencies.



Curcuma amada Roxb. (Zingiberaceae) is credited with compounds having remarkable pharmacological properties.



Bavistin proved three times more effective in regeneration of contamination-free plantlets.



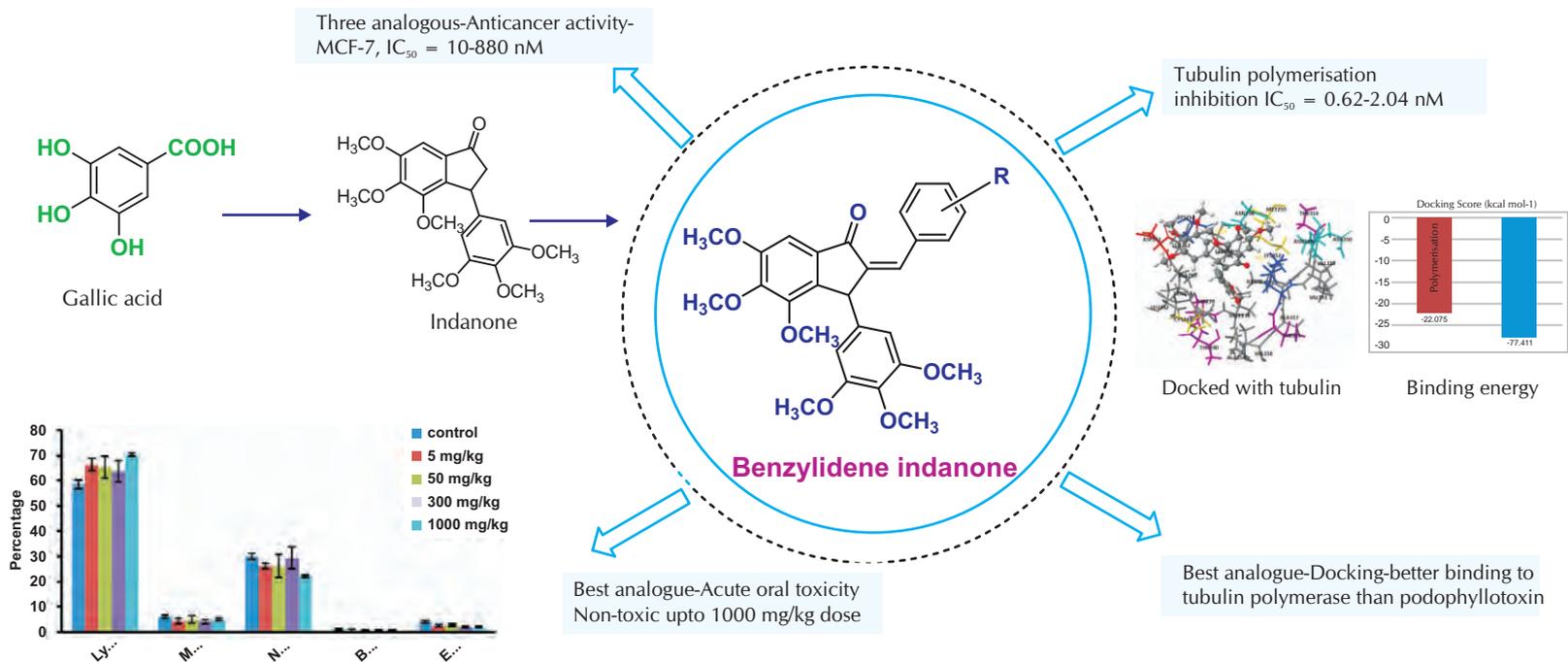
RAPD fingerprinting revealed 84.62% genetic similarity between randomly selected synthetic seed derived plantlets

Industrial Crops and Products 36 : 383– 388, 2012 (IF 2.507)

Activity : New molecules with anti-cancer activity

Input : AS Negi, S Luqman, D Chanda, Atul Gupta, CS Chanotiya, Karuna Shanker, Feroz Khan

Gallic acid derived "Indanone" moiety was optimized to better anticancer agents. "Benzylidene indanones" were proved to be better anticancer agents.

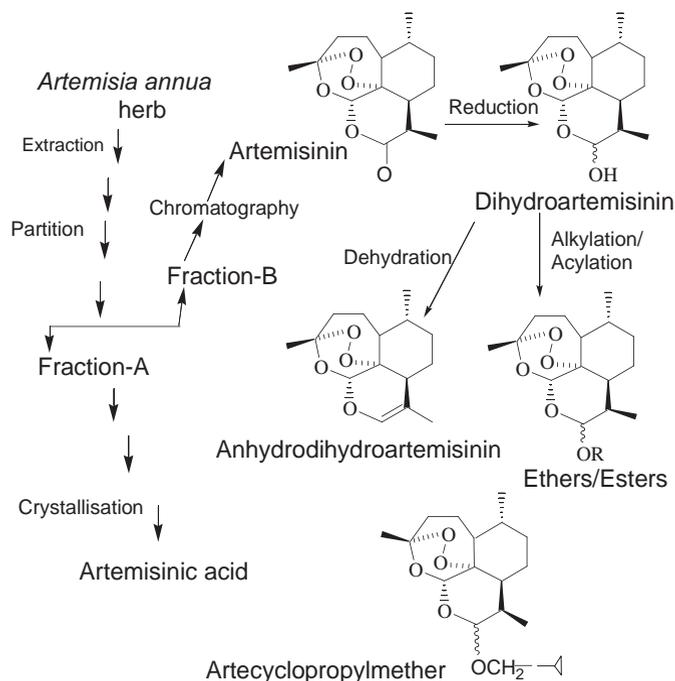


Indian Patent Appl. No. 133NF2011; US Patent Provisional Application No. 2769DEL2011, dt. 22-09-2011
Biorganic Medicinal Chemistry 20: 3049-57, 2012 (IF 2.98)

Activity: Isolation of artemisinin, artemisinic acid and synthesis of new artemisinin derivatives for their anti – *Helicobacter pylori* activity

Input : RS Bhakuni, Anirban Pal

- Fifteen artemisinin derivatives (eight new) were synthesized.
- Out of five promising molecules tested, one new ether derivative, artecyclopropylmethether was found to be most potent, exhibiting MIC-range, MIC50 and MBC-range values of 0.25-1.0 µg/ml, 1.0 µg/ml and 1-16 µg/ml, respectively.
- It is non-toxic, exhibits *in vivo* potentiality to reduce *H. pylori* burden in chronic infection model. Work flow chart is as under:



Parasitology Research 109 (4) 1003-1008, 2011 (IF 2.14)

Activity: HPTLC method for *Alstonia scholaris*

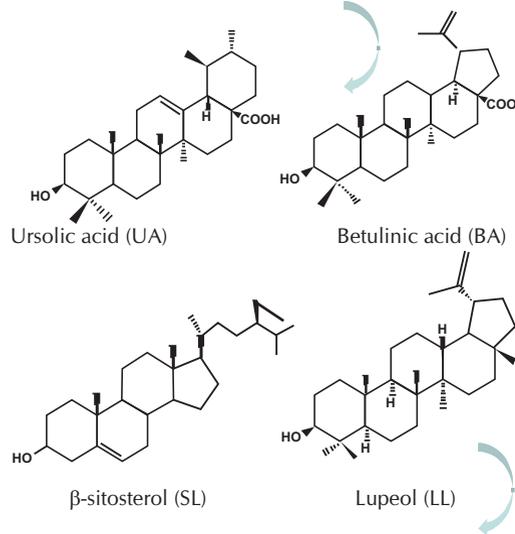
Input : SK Srivastava

An efficient HPTLC method for the simultaneous quantitation of four bio-active markers, ursolic acid(UA), betulinic acid (BA), β -sitosterol (SL) and lupeol (LL) in the various parts of *A. scholaris* used in Ayurvedic, Homeopathic and folklore system of Indian medicine for various ailments, has been developed.



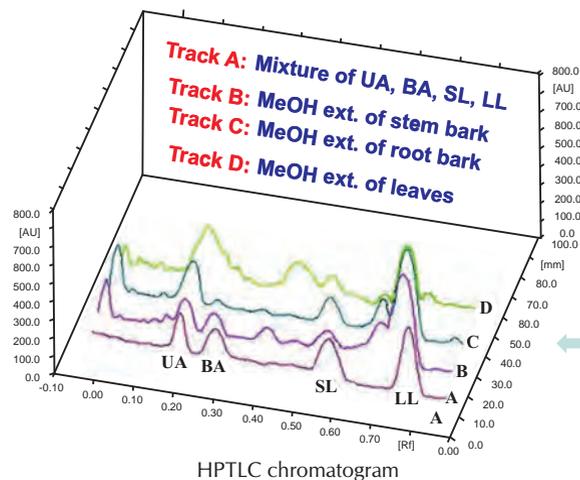
Stem bark

On chromatographic separation afforded following markers



Stem bark, root barks and leaves of *A. scholaris*

Quantitative determination of four markers in stem bark, root bark and leaves of *A. scholaris*



Activity : Discovery and preclinical studies of new bioactive molecules (natural and semi-synthetic) and traditional preparations. Bioenhancing activity of *Ammannia multiflora*

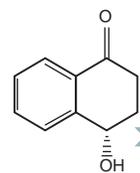
Input : SK Srivastava

The chemical investigation of *Ammannia multiflora* afforded one novel and 9 known compounds. The MeOH extract and compound 1 showed four folds while the other compounds and derivatives (1A-1E) showed two fold reduction in the dose of Nalidixic acid. The compound 5 also showed moderate antimycobacterial activity (MIC 25 $\mu\text{g}/\text{ml}$) against mycobacterium H37Rv.



Ammannia multiflora

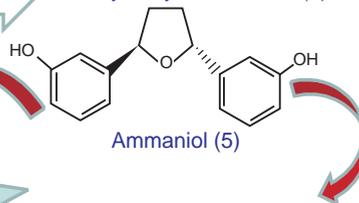
Isolation of novel compound ammaniol along with 9 known compounds



Preparation of five acyl/aryl derivatives of 1

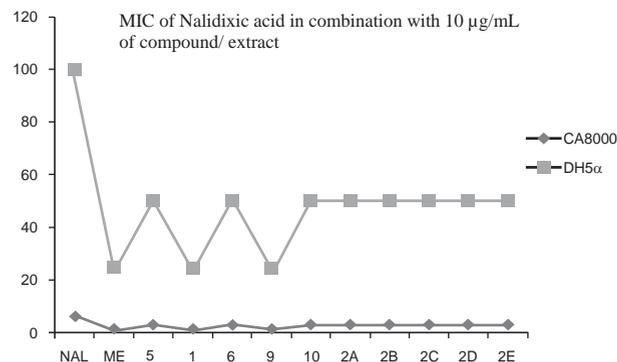
4-O-m-Anisyl- α -tetralone (2A)
4-O-Cinnamoyl- α -tetralone (2B)
4-O-Palmitoyl- α -tetralone (2C)
4-O-(3,4,5-Trimethoxybenzoyl)- α -tetralone ((2D)
4-O-Myricitoyl- α -tetralone (2E)

4-hydroxy- α -tetralone (1)



Ammaniol (5)

Antimycobacterial (MIC 25 $\mu\text{g}/\text{ml}$)

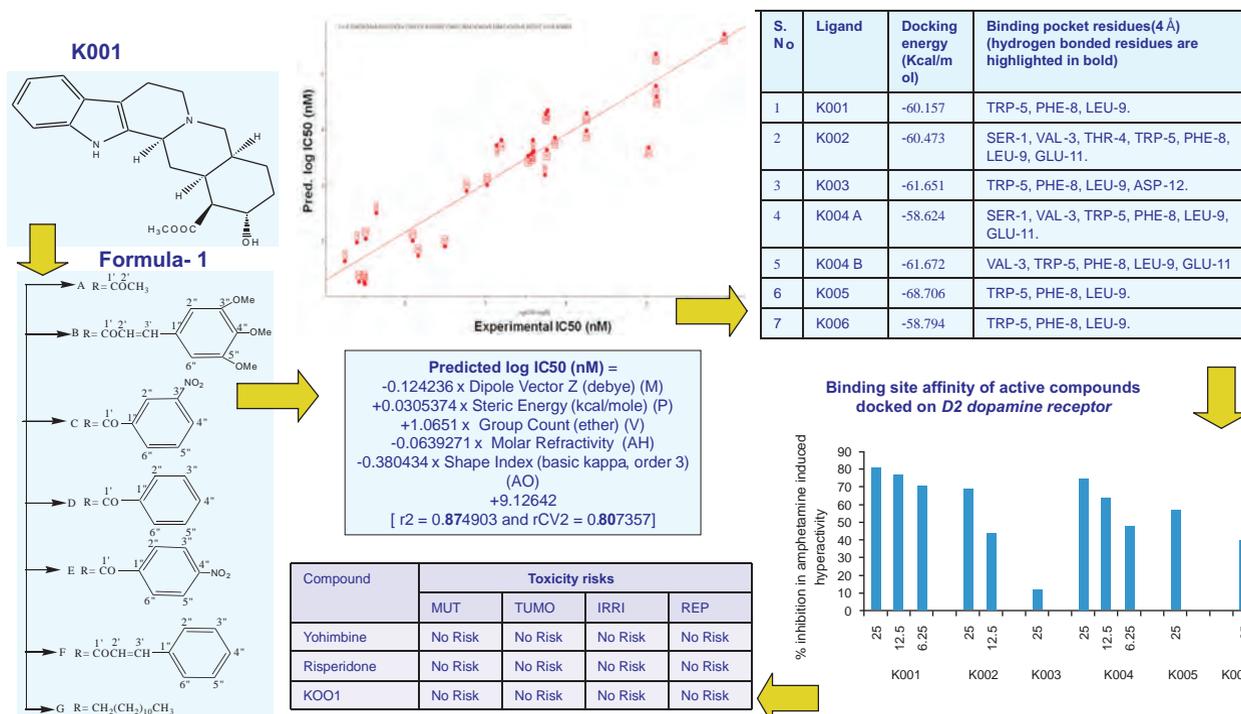


- The MeOH extract, compound 1 and 9 showed significant bioenhancing activity and reduced the dose of nalidixic acid four folds.
- While compounds 5, 6, 10 and derivatives 2A-2E reduced the dose of nalidixic acid by two folds.
- Ammaniol (5) showed moderate activity (MIC 25 $\mu\text{g}/\text{ml}$) against Mycobacterium H37Rv.

Activity : Method for predicting and modeling antipsychotic activity using virtual screening model

Input : SK Srivastava and Feroz Khan

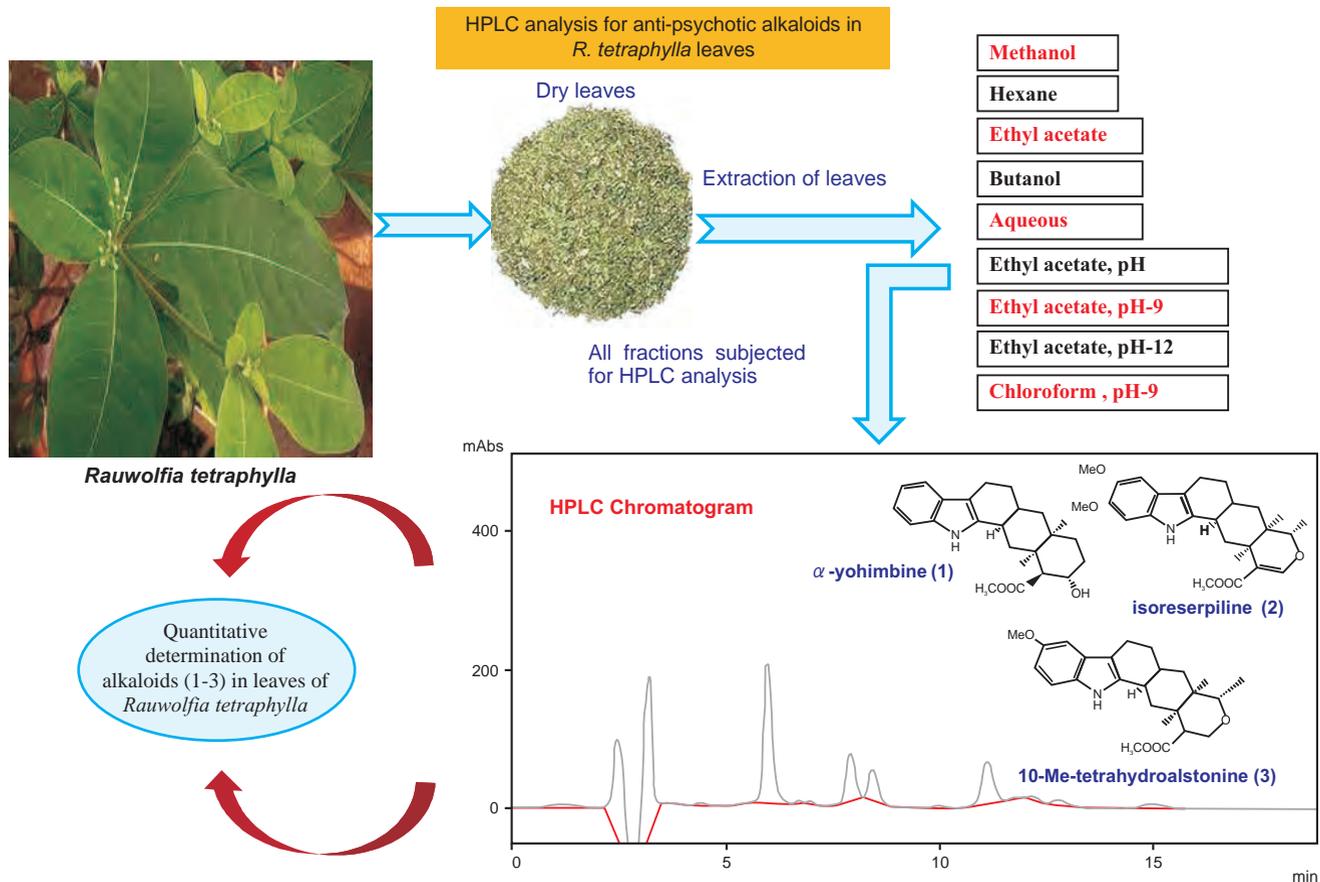
Since α -yohimbine showed significant antipsychotic activity in our hand, we developed a statistically validated QSAR regression model for the prediction of antipsychotic activity in the virtual derivatives of α -yohimbine for the optimization of antipsychotic lead.



Activity : HPLC analysis for anti-psychotic alkaloids in *Rauwolfia tetraphylla* leaves

Input : SK Srivastava

Significant antipsychotic activity in the various extracts and fractions of *Rauwolfia tetraphylla* leaves has been reported by us and a simple isocratic HPTLC method for the simultaneous quantitation of three antipsychotic alkaloids, α -yohimbine(1), isoreserpiline (2) and 10-methoxytetrahydroalstonine (3) from *Rauwolfia tetraphylla* leaves were developed.

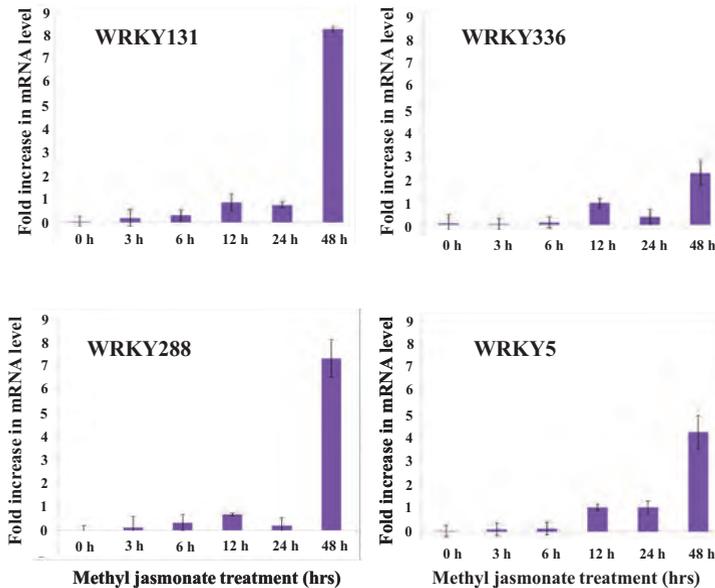


Journal of Liquid Chromatography and Related Technology, 35 (7) 937-950, 2012

Involvement of WRKY transcription factors in withanoloid pathway

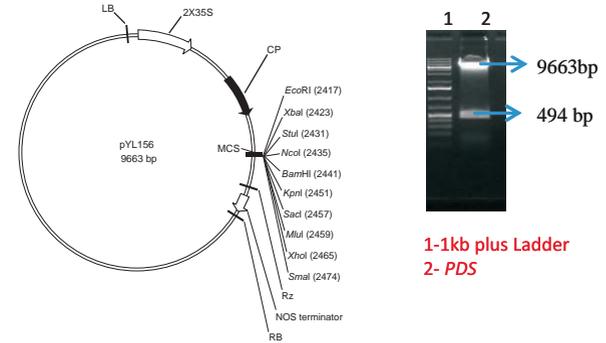
Input : Dinesh Nagegowda

Withania somnifera WRKY transcription factors gene expression in response to methyl jasmonate



The mRNA expression of *W. somnifera* WRKY131, 336, 288 and 5 was significantly induced in response to methyl jasmonate (known inducer of withanolide biosynthesis), suggesting their involvement in regulation of withanolide pathway.

Virus induced gene silencing (VIGS) in *W. somnifera* for study of gene function



A 494 bp fragment of phytoene desaturase (PDS) gene was isolated from *W. somnifera* and cloned into VIGS vector pTRV2 vector (pYL156).

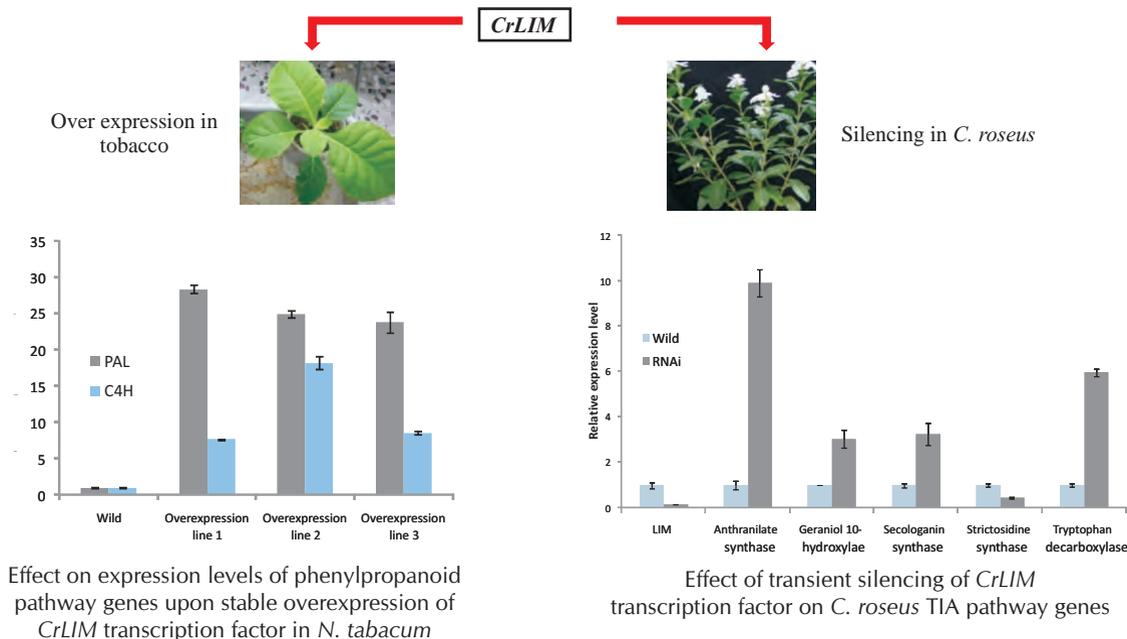


W. somnifera plants inoculated with *Agrobacterium* carrying VIGS construct for PDS showed silencing effect (bleached part) after 15 to 20 days of inoculation.

Activity: Characterization of transcriptional regulators from *Catharanthus roseus*

Input : Vikrant Gupta

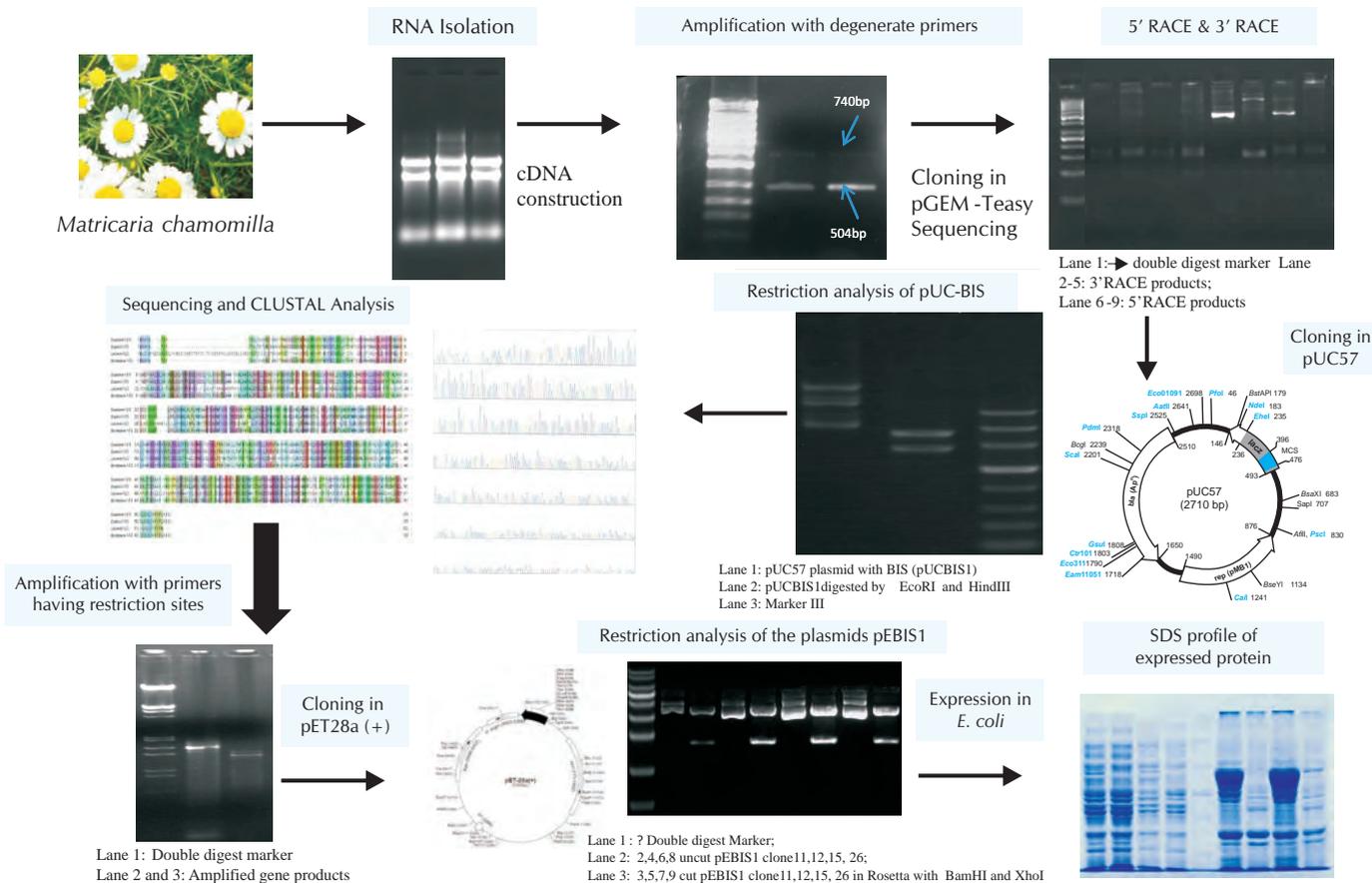
In plants, phenylpropanoid pathway is known to be regulated by LIM transcription factors. Hence, to manipulate the regulation of secondary metabolic pathway genes in *Catharanthus roseus*, a LIM transcription factor was isolated and cloned. To decipher its role in the regulation of secondary metabolic pathways in *C. roseus*, overexpression and silencing (RNAi) constructs were made in plant binary vectors. *Agrobacterium*-mediated transient transformation using RNAi (silencing) was carried out in *C. roseus* seedlings while stable overexpression was done in *N. tabacum*. The over expression of *CrLIM* significantly up-regulated phenylalanine ammonia lyase (*PAL*) and cinnamate 4 hydroxylase (*C4H*) genes in *N. tabacum* and *C. roseus* as well. Transient silencing of *CrLIM* in *Catharanthus* indicated an up-regulation of key terpenoid indole alkaloid (TIA) pathway genes.



Activity : Cloning, characterization and expression studies of α -bisabolene synthase gene from *Matricaria* spp.

Input : Suaib Luqman

Using degenerate primer sequences, two amplified gene fragments from cDNA of *Matricaria chamomilla* flower were gel purified and cloned in pGEM-Teasy vector for sequencing. Sequencing and BLAST x analysis showed 94 and 70% identity with monoterpene synthase of *Santlum* species. Further amplification through 3' and 5' RACE and cloning in pUC57 and sequencing followed by BLASTx analysis revealed 93% homology to Bisbolene synthase from *Santlum austrocaledonicum*.



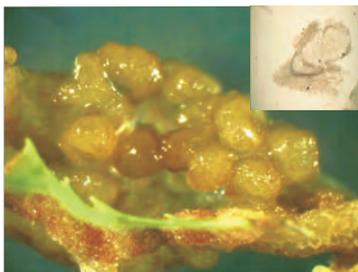
Activity : Direct regeneration studies in *Tagetes erecta*

Input : Laiq-ur-Rahman

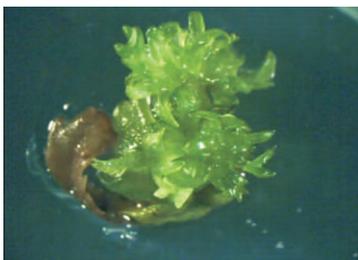
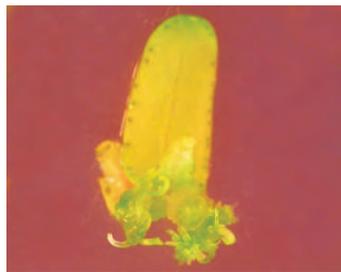
A protocol was developed for differentiation of shoot buds directly from different explants of *Tagetes erecta* like cotyledonary leaf, rachis, hypocotyls etc., using various media composition.

Gibberellic acid (GA^3) plays a significant role in the induction of shoot buds and in suppressing callus formation. To increase the multiplication rate of shoot buds, various combinations of 6-benzylaminopurine and GA^3 were tried. Differentiated shoots grew well and proliferated in the MS medium. The shoots developed efficient root system on same medium. Complete plants were transferred and established in soil.

Somatic embryogenesis



Shoot regeneration from cotyledons



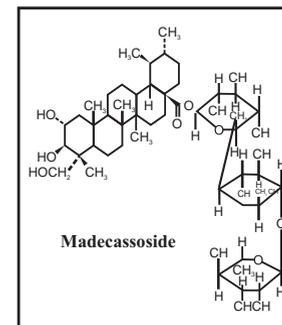
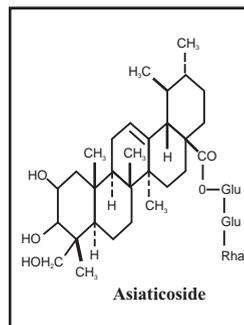
Shoot regeneration from leaf



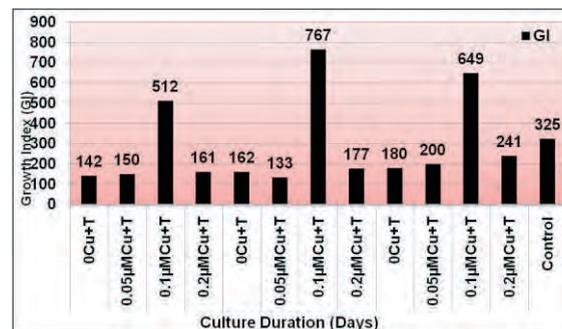
Shoot regeneration from hypocotyl

Activity : Enhanced centelloside production in *Centella asiatica* through biotic and abiotic elicitations

Input : Archana Mathur



Improved centelloside (asiaticoside, madecassoside) production achieved with biotic/abiotic elicitation simultaneously in *in vitro* cultured multiple shoots.



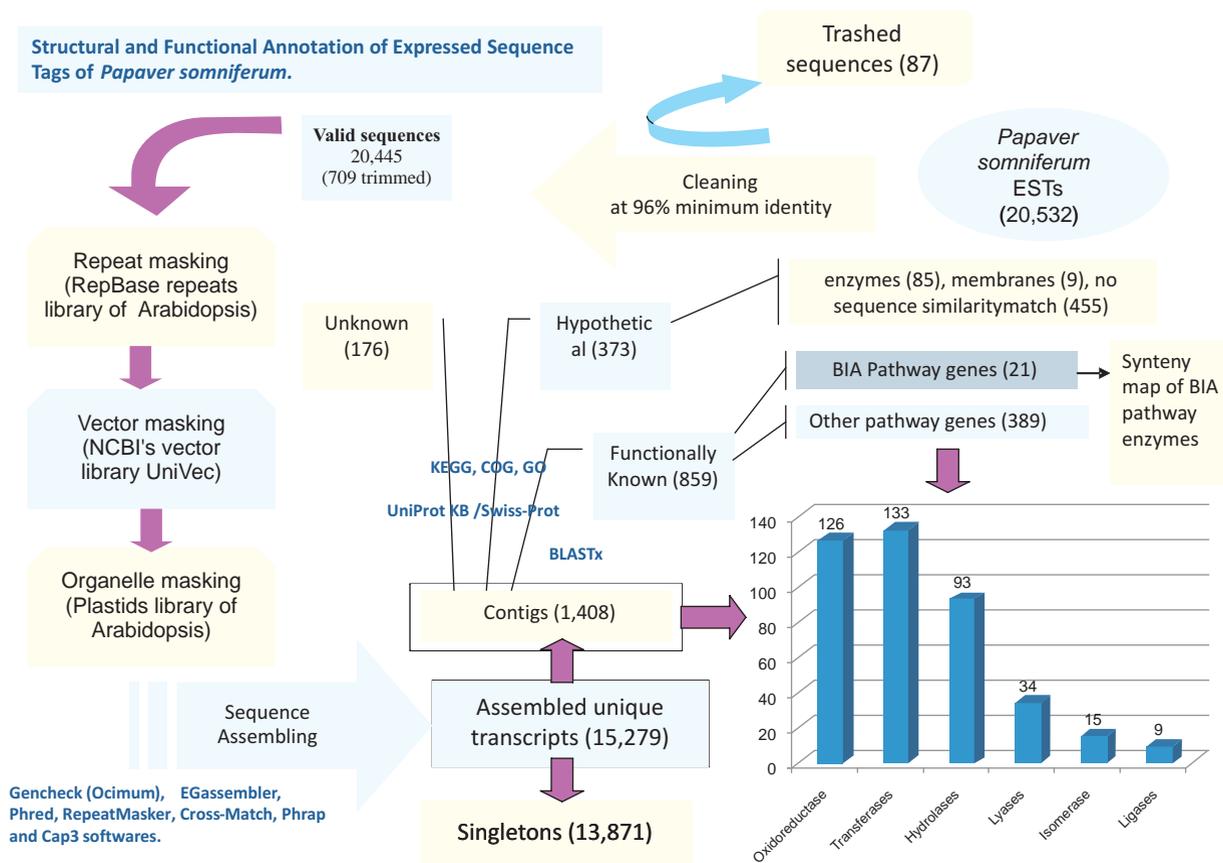
- Maximum growth Index (767) observed after addition of Cu^{++} with *Trichoderma* culture filtrate
- Multiple shoot cultures treated with Cu^{++} with *Trichoderma* culture filtrate showed maximum centelloside yield (0.381)

Journal of Natural Medicine 66(2): 383-387, 2012

Activity : Development of *in silico* synteny map for benzyloquinoline alkaloids pathway enzymes

Input : Feroz Khan

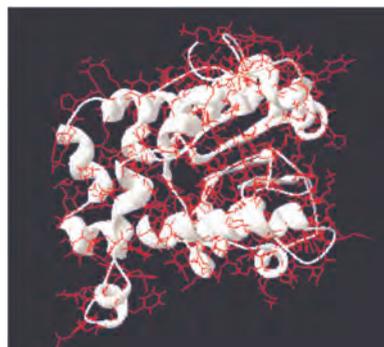
To identify additional bio-synthetic steps in pharmaceutically important benzyloquinoline alkaloids (BIA) of opium poppy using a large expressed sequence tag (EST) a total of 15279 assembled unique transcripts were identified, of which 1408 were contigs and 13871 were singleton. Hypothetical genes were observed apart from important genes related to BIA biosyntheses enzymes. This functionally annotated EST data set will be a useful resource for further studies viz. taxonomy, molecular breeding, genetics, genomics and secondary metabolism.



Activity : Structure prediction and functional characterization of secondary metabolite proteins of *Ocimum*

Input : Ashok Sharma

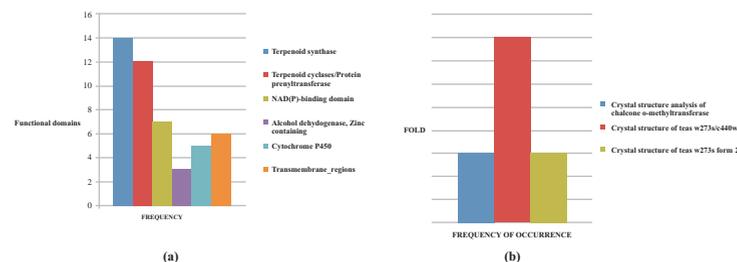
Two secondary metabolite proteins viz., eugenol o-methyl transferase and chavicol o-methyl transferase from various species of *Ocimum* were modeled using homology modeling approach. Physicochemical characterizations of the modeled proteins were performed. Secondary structure studies showed that the modeled proteins contain high proportion of other secondary structures i.e. beta-turns and gamma-turns. This is attributed to the presence of higher concentration of proline and glycine residues. Homology derived models are extensively used in wide range of applications such as virtual screening, site-directed mutagenesis experiments or in rationalizing the effects of sequence variation. These structures will serve as cornerstone for functional analysis of experimentally derived crystal structures.



Modeled structure of chavicol o-methyltransferase

Bioinformation 6(8): 315-319, 2011

Activity : *In silico* approaches in comparative genomics, structure prediction and functional characterization of secondary metabolite proteins of *Mentha* sp.



Motif showing high frequency of occurrence in SMPs

Folds showing high frequency of occurrence in SMP

In-silico identification and characterization of expressed genes with the help of ESTs through assembly and comparative genomics was performed for *Mentha* species. It was followed by finding out the proteins which can be expressed by individual contig in *Mentha* species followed by comparative modeling /molecular threading to derive secondary metabolite protein models. Results revealed that terpenoid synthase proteins showed highest frequency of occurrence in secondary metabolite proteins. Also crystal structure of teas w273k/c440w folds were in high frequency amongst the secondary metabolite protein reported in *Mentha* species. All the generated protein models were successfully submitted in Protein Model Database (PMDB).

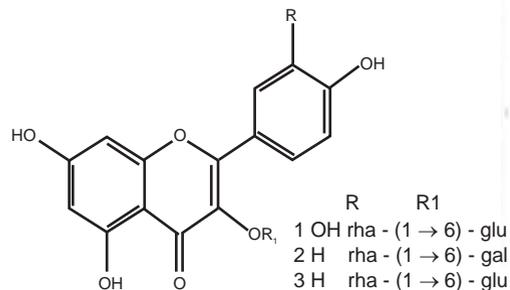
Plant Omic Journal 4(7): 354-363, 2011 (IF 1.734)

Activity : A validated stability-indicating HPLC-PDA method for analysis of *Desmodium gangeticum*

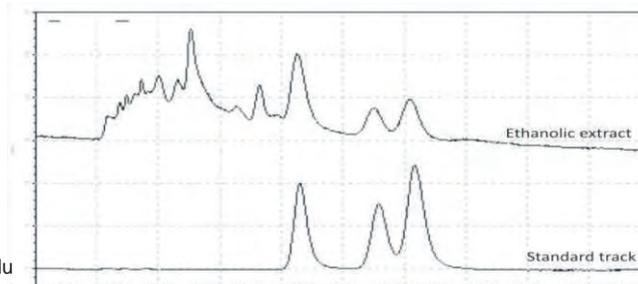
Input : MM Gupta



Desmodium gangeticum

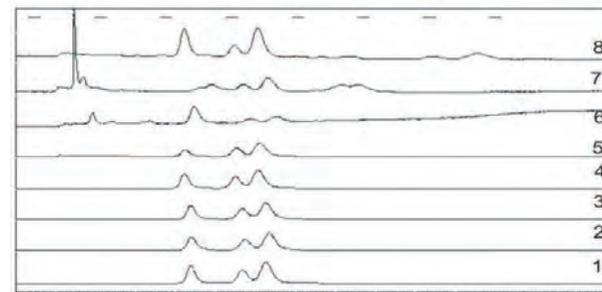


Chemical structure of marker compounds



HPLC chromatogram of standard markers and extract

A stability-indicating reversed-phase liquid chromatographic (RPLC) method has been established for analysis of rutin (1), kaempferol-3-O-robinobioside (2), and nicotiflorin (3) in *Desmodium gangeticum*. The study was performed in the presence of the degradation products generated in the study of forced degradation. Marker compounds were subjected to stress by hydrolysis (acidic and basic), oxidation, photolysis, and thermal treatment. Under the optimized conditions, well-resolved separation of pure compounds from the degradation products with significantly different R_t values was achieved on a Spherisorb ODS2 column (250mm x 4.6 mm, 10 μ m) using isocratic elution of methanol and water (0.5% acetic acid); with acceptable validation results such as linearity, sensitivity, and recovery. The reproducible and robust method may be applied for assays and stability tests of *D. gangeticum* and phytopreparations containing *D. gangeticum*.



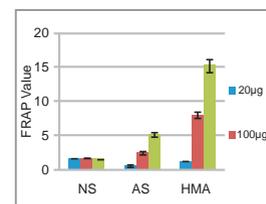
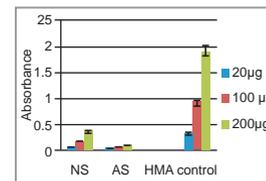
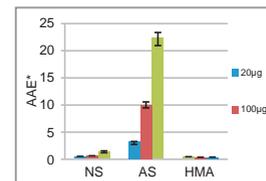
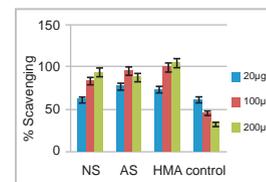
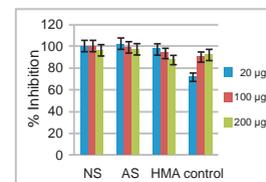
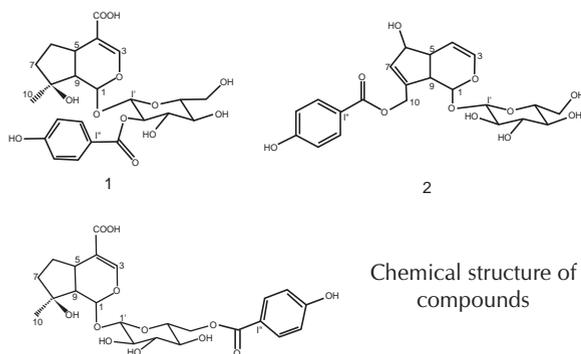
Journal of Liquid Chromatography and Related Technologies 35: 1038-1052, 2012 (IF 0.96)

Activity : High performance thin layer chromatographic method for simultaneous quantification of major iridoids in *Vitex trifolia* and their antioxidant studies

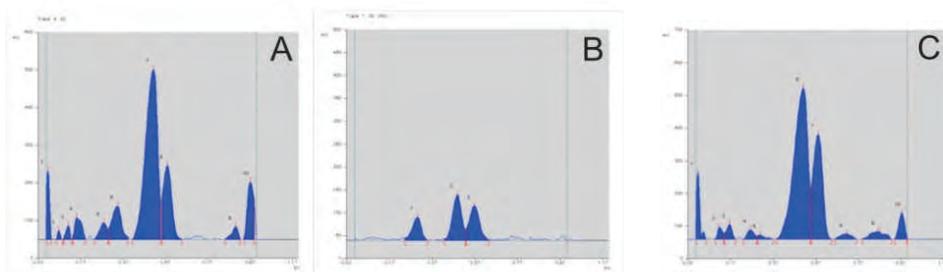
Input : MM Gupta



Vitex trifolia



In vitro anti-oxidant effect of negundoside (NS) (1), agnuside (AS) (2) and 6'-p-hydroxy benzoyl mussaenosidic acid (HMA)(3)

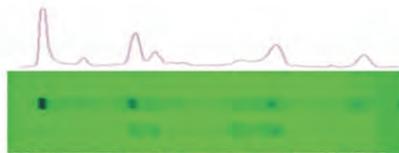
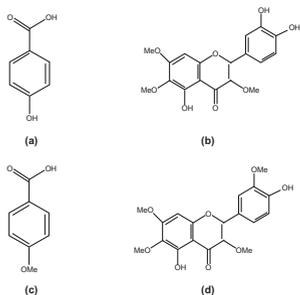


The representative HPTLC chromatograms of *V. trifolia* leaf extract (A), standards (B); and *V. negundo* leaf extract (C)

Negundoside (1), agnuside (2) and 6-p-hydroxy benzoyl mussaenosidic acid (3) are known bioactive metabolites in *Vitex trifolia*. A simple precise and reproducible method was developed for simultaneous quantitation of NS (1), AS (2) and HMA (3) and the antioxidant capacity of above markers has also been determined. Marker compounds have been resolved using silica gel 60 F254 plates, petroleum ether (60–80)/toluene/acetone/water (10:10:80:2 v/v/v/v) as the mobile phases. The method does not employ any derivatisation procedure and can be used as a quality control tool for routine analysis of drugs *V. trifolia* and *V. negundo* together with their commercial extracts. NS (1), AS (2) and HMA (3) showed significant activity in DPPH and NO radical scavenging assays.

Activity : A marker based stability indicating HPTLC method for *Vitex trifolia*

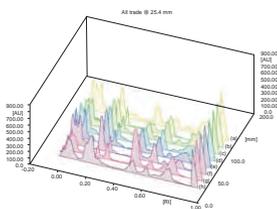
Inputs : MM Gupta



HPTLC Chromatogram of markers in standard and sample

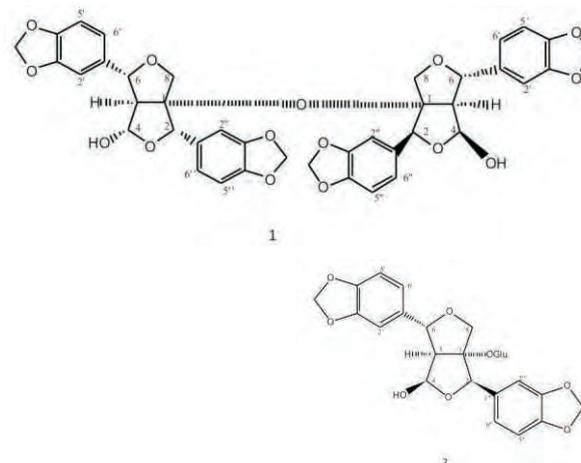
Chemical structure of marker compounds

p-Hydroxy benzoic acid (a), chrysofenol-D (b), p-methoxy benzoic acid (c) and casticin (d) are representative flavonoids and benzoic acid derivatives in *Vitex trifolia*, a well-known traditional Chinese, and Ayurvedic medicine, with a wide range of biological activities. In the present study, a novel stability-indicating HPTLC method for quantitative determination of the aforementioned isolated four markers has been developed and validated on silica using solvent dichloromethane–methanol–formic acid (9.6:0.4:0.06 v/v/v) in the absorbance mode at 254 nm. It was found to be linear, accurate, precise, specific, robust, and stability-indicating and can be applied for quality control and standardization of other multi-component formulations based on *Vitex trifolia*.



HPTLC chromatograms of samples under various degradation conditions

Activity : Chemical investigation of *Premna integrifolia*



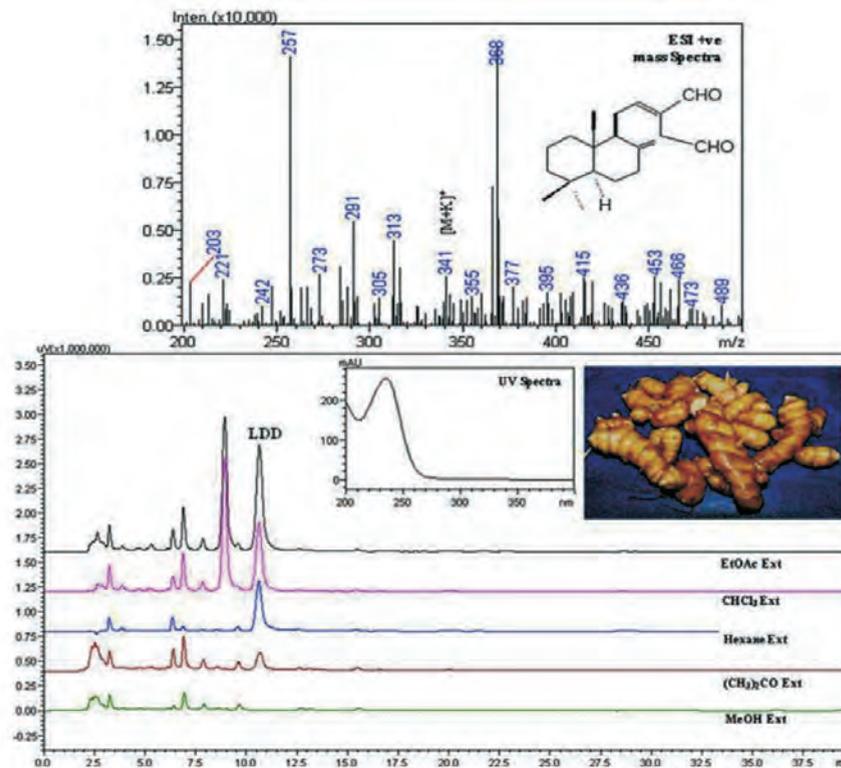
Chemical structure of isolated markers from *P. integrifolia*

Two new furofuran lignans premnadimer (1) and 4β-hydroxyasarinin-1-O-β-glucopyranoside (2) along with nine known compounds have been isolated from the stem-bark of *Premna*. Compounds 1, 2 together with four known iridoid glycosides were evaluated for radical scavenging and ferric reducing antioxidant power. Radical scavenging activity was found maximum in 4''-hydroxy-E-globularinin followed by 10-O-trans-p-coumaroylcatalpol and new dimer (1). In FRAP assay, premnosidic acid, 10-O-trans-p-coumaroyl-6-O-α-L-rhamnopyranosyl catalpol showed maximum ferric reducing ability supported by high reducing power.

Activity : Development of validated RPLC-PDA-MS method for the analysis of anti-tubercular agent in mango ginger (*Curcuma amada* Roxb.)

Input : Karuna Shanker

Mango ginger (*Curcuma amada*) is a spice of high usage in pickles, sauce, culinary formulations and traditional/folk systems of medicine for therapeutic actions in Asian countries. After establishing scheme for isolation and characterization of labdane diterpene dialdehyde [labda-8(17), 12-diene-15, 16-dial]-an anti-tubercular agent, a new validated HPLC-PDA method for its quantification in *C. amada* was developed. Chromatography was performed with reverse phase column in isocratic condition at a flow rate of 1.0 mL/min using mobile phase of acidified water and acetonitrile. Specificity of determination was achieved with UV (190-400nm) and mass spectrum. Good linearity was obtained with correlation coefficients >0.99. Present validated method allowed both the identification and determination of labda-8(17), 12-diene-15, 16-dial, in *C. amada* rhizome. The method was applied to screen the labdane diterpene dialdehyde in the samples of different geographic locations.



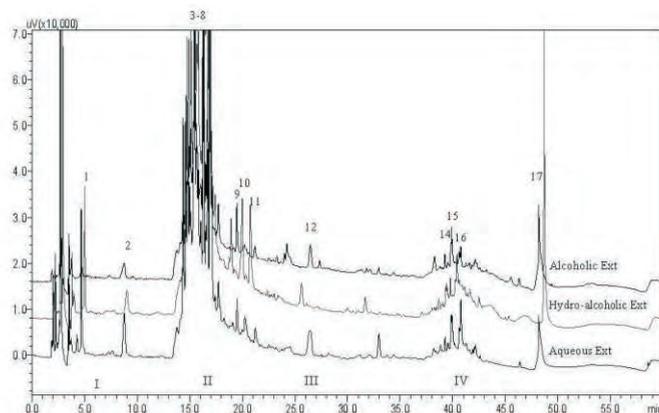
Representative HPLC fingerprints of *C. amada* rhizome extract (0.1g/mL) showing Labda -8 (17), 12 diene -15, 16-dial (LDD) bioactive marker along with its characteristic +Ve ESI-MS and UV spectra.

Food Chemistry 131 (1) : 375-379, 2012

Activity : Application of HPLC fingerprints for defining *in-vivo* safety profile of Tulsi (*Ocimum sanctum*)

Input : Karuna Shanker

Ocimum sanctum is well known for its wide range of therapeutic activities. A methodology to define the safety of the herb with its chromatographic fingerprint has been established. We report the fingerprint method for three standardized extracts of *O. sanctum* and the correlation of the chromatographic peaks with their *in-vivo* pharmacological safety profile. HPLC fingerprint with the statistical similarity correlation were validated and used in acute and sub-acute toxicity studies in Charles Foster rats. Under optimized chromatographic conditions, numbers of constituents of *O. sanctum* were successfully separated by the reverse-phase HPLC methods. Various groups have been marked in the chemical fingerprint. The effects on body weight and biochemical indices were mainly related to the chromatographic peaks of group II and V. On the basis of characteristic UV spectra, it was observed that the peaks of group II were related with phenolic moieties. Further, the peak number 11 of group II was characterized as rosmarinic acid-a naturally-occurring polyphenolic compound with antioxidant and anti-inflammatory properties by reference comparison. All three extracts in both acute and sub-acute toxicity experiments were well tolerated and no adverse changes were observed in mortality, morbidity, gross pathology, body weight and biochemical parameters. This accurate and reproducible method can be used for the chemical identification standardized extract of *O. sanctum* leaves, batch-to-batch quality assurance, adulteration and their safety evaluation.

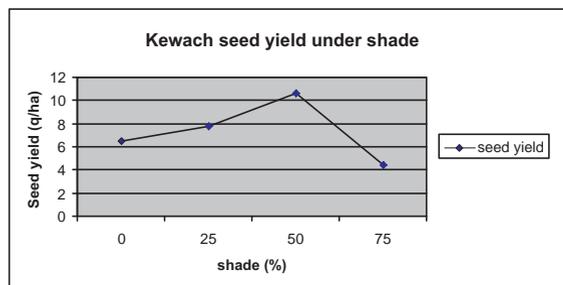


Representative RP-HPLC fingerprint of various standardized extracts of *O. sanctum* leaf

Activity : Performance of kewach under different levels of shade

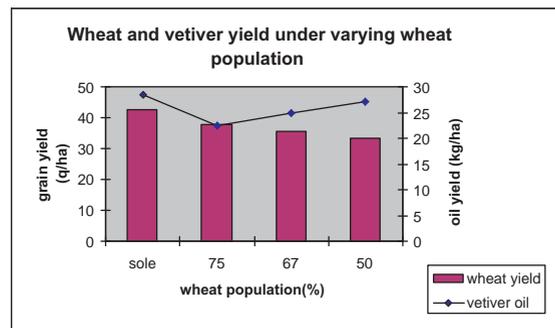
Inputs : HS Chauhan

Field experiment was conducted to evaluate the performance of Kewach (*Mucuna pruriens*) cv. CIM-Ajar under different degree of shade (0,25,50 and 75%). The data showed that seed yield with 50% shade was maximum (10.6 q/ha) and significantly better than open and 75% shade.



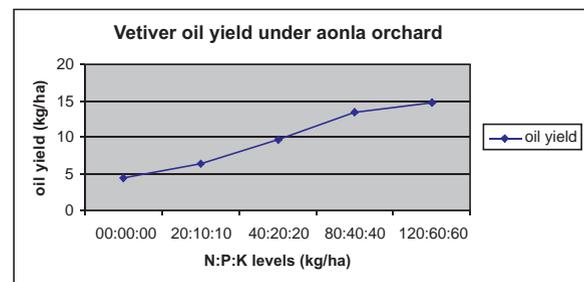
Activity : Possibilities of relay intercropping vetiver in wheat

An experiment on yield adjustment of wheat indicated that by reducing the wheat population by 25% and 50%, loss in grain is only 11 and 21% . Twenty five to fifty per cent space was left to facilitate the timely (November) planting of vetiver as intercrop. Thus grower is assured of one highly profitable crop 22 and 27 kg vetiver oil/ha at the cost of 11% and 21% reduction in wheat yield, respectively.



Activity : Intercropping of vetiver in aonla orchard

Experimental results of vetiver in aonla orchard indicated that plant population of vetiver 1, 11,000 plants/ha and application of 80:40:40 kg NPK/ha was suitable for achieving highest 13.5 kg/ha vetiver oil.



Activity: Plant protection strategies for integrated disease management of MAPs : *Withania* wet rot caused by *Choanephora cucurbitarum*

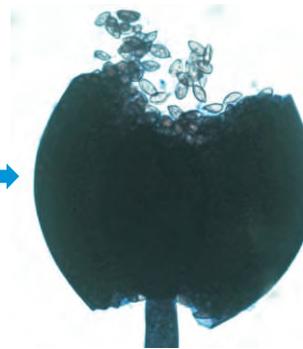
Input : Mansoor Alam, HN Singh and Abdul Khaliq

Pathogen associated with wet rot

A new disease initially produced water soaked lesions on leaves and stems progressed to a wet rot appearing in *Withania* fields during monsoon at Lucknow and in adjoining areas of northern India.



Fruiting head



Sporangia



Disease was established to be caused by *C. cucurbitarum*

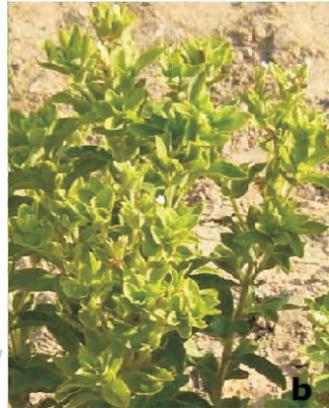
Based on cultural, morphological and molecular characteristics, fungus was identified as *Choanephora cucurbitarum* (Berk. & Ravenel) Thaxt. Its sequence was submitted to NCBI GenBank with accession no. JN639861.

Plant Disease 96: 293, 2012 (IF 2.387)

Activity : Plant protection strategies for integrated disease management Study of leaf disease in *Stevia*

Input : A Samad, P V Ajayakumar and Ashutosh K Shukla

Stevia rebaudiana Bertoni (Asteraceae) is an important commercial crop that produces 'natural sweetener' which is 300 times sweeter than sucrose.

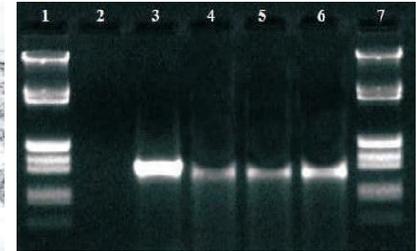
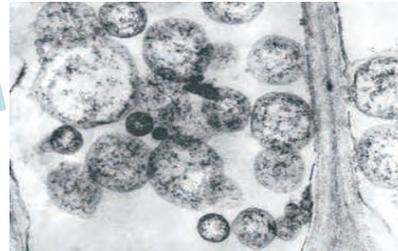


Typical phytoplasma-like (pleomorphic) bodies ranging in size from 450-900 nm were observed in the phloem cells of infected plants using transmission electron microscopy

Universal phytoplasma primers followed by nested primers produced 1.5 and 1.2 kb amplicons respectively from the symptomatic plants.



An unknown little leaf disease affected 20% of the field-grown crop resulting in significant reduction in quality and biomass through growth cessation, bronzing of mature leaves, wilting and death of plants.



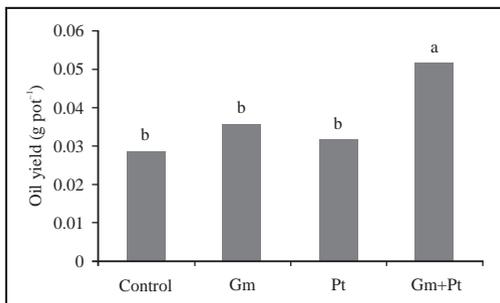
The sequence of the final PCR product shared 98.2% similarity with that of the 'Sorghum bunchy shoot phytoplasma' reference strain (GenBank accession: AF509322) that belongs to 16SrXXIV-A subgroup.

First report of a natural infection of *Stevia rebaudiana* by a group of 16SrXXIV-A phytoplasma

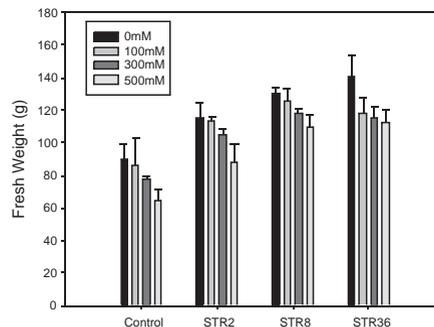
Plant Disease 95: 1582, 2011 (IF 2.387)

Activity : Microbial interventions to improve yield and reduce stress-induced damages in MAPs

Input : Alok Kalra

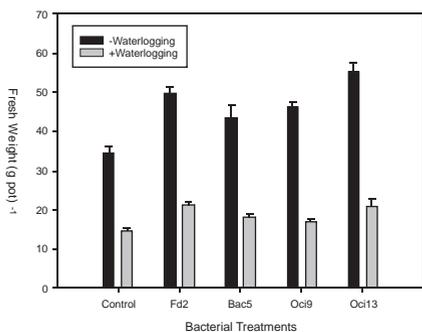


Treatment of cuttings in nursery with microbial consortium of IAA producing *Pantoea* sp. and AM fungi *Glomus aggregatum* improved oil yield in *Pelargonium graveolens*



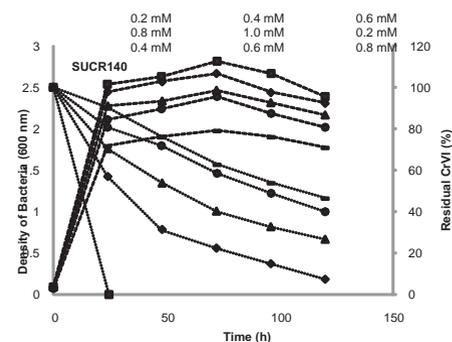
Salt tolerant PGPRs *Halomonas desiderta* (STR 8) and *Exiguobacterium oxidotolerans* (STR 36) protected plants from 300mM NaCl stress in *Mentha arvensis*

Protection from water logging



ACC deaminase producing *Achromobacter xylosoxidans* (Fd2) and *Ochrobactrum rhizosphareae* (Oci13) improved growth under water logging stress in *Ocimum sanctum*.

Chromate reducing bacteria

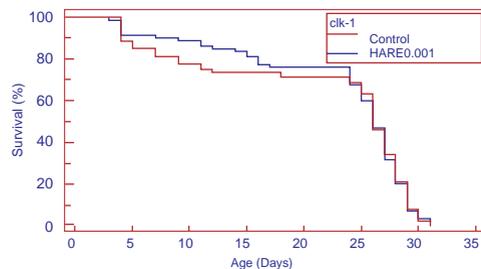


Microbacterium sp.(Sucr 140) an efficient chromium reductase producing bacteria reducing Cr(VI) within 24 hr

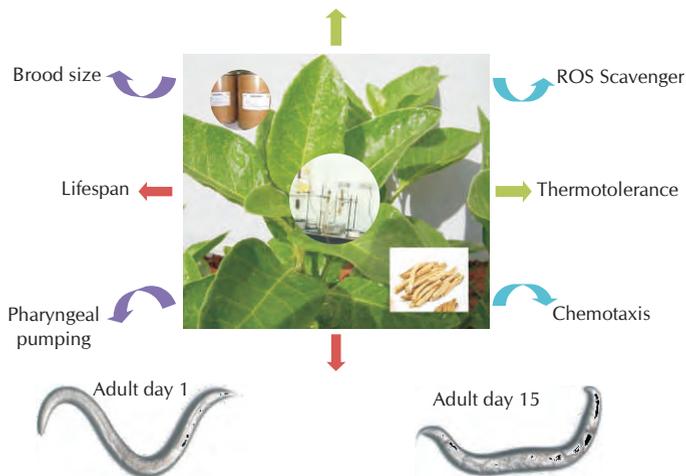
Activity : Antiaging and stress tolerance potential of hydroalcoholic root extract of *Withania somnifera* in *Caenorhabditis elegans* via activation of clk-1

Input : Rakesh Pandey

The hydro-alcoholic root extract (HARE) of *Withania somnifera* (L) Dunal, has increased life span (14%) with reduction of free radicals level in *C. elegans*. Exploration of life span increasing mechanism through mutants and different effective doses exhibited diverse mode of actions of *W. somnifera* through clk-1.



Life span extension via activation of clk-1



Activity : Field testing and demonstration of improved version of khus digger

Input : JP Tiwari

Manual harvesting of long khus roots is a major challenge and a costly affair. Mechanized approach is a potential alternative to make the process efficient and cost effective. Previously developed prototype model of khus digger has been improved further based on feedback.

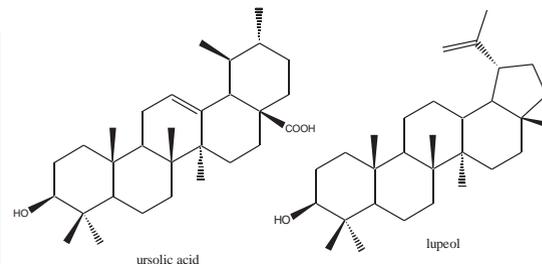
The advance version of khus digger has been tested at the farmer's field at Bambhaur village, Mahmoodabad, district Sitapur, UP. Performance has been found satisfactory and better than previous version.



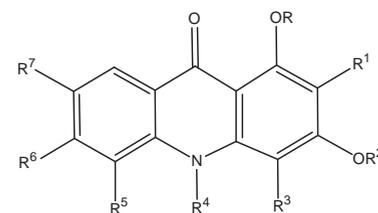
Activity : Chemical investigations of important MAPs

Input : L N Misra

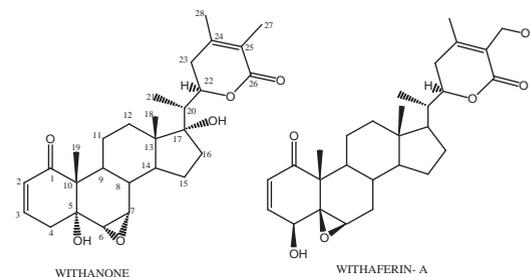
The bark of *Saraca asoca* has been extracted with various solvents. These extracts are being investigated for their chemical constituents. The n-hexane extract after isolation and purification has yielded several triterpenoids and steroids, viz. ursolic acid, lupeol, campesterol, β -sitosterol, gluchidiol, stigmasterol, etc. Among them, ursolic acid is a well known biologically active molecule and lupeol and β -sitosterol are the other major active compounds. The methanol and aqueous methanol extracts are being chemically investigated.



Zanthoxylum zanthoxyloides and *Z. leprieurii* have been chemically investigated for their chemical constituents. This is the first report that the fruits of *Z. zanthoxyloides* have yielded several acridone alkaloids. Among them, zanthacridone alkaloids are being reported having a new type of acridone carbon skeleton. One of the isolated alkaloids showed a promising activity with an IC_{50} of 26 μ g/mL against WRL-68 (liver cancer cell lines).



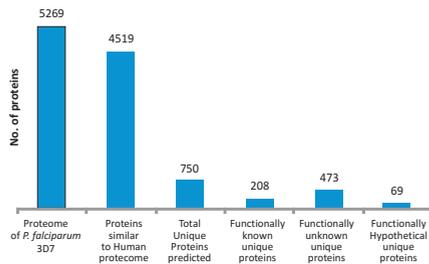
The major compounds, viz. withaferin A, withanone have been isolated in larger amounts from *W. somnifera* leaves. Chemical transformation has been attempted for value addition in their biological activities. Structure activity relationship is being studied with respect to the various functional groups of withasteroids.



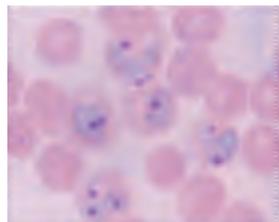
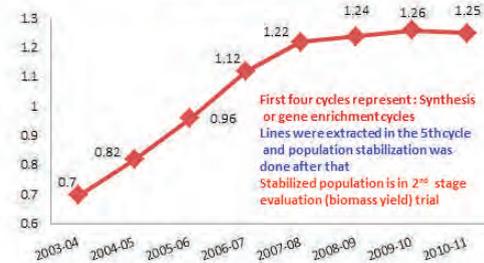
J Asian Nat Prod Res, 14, 39-45, 2012
Ind Crop. and Prod., 37, 195-99, 2012

Anti-malarials from medicinal and aromatic plants

Input : Anirban Pal and team



Response to selection for artemisinin content in different gene enrichment cycles



Activity limits
In-vitro < 50µg,
In-vivo 100mg/kg
bd.wt.

Parasite inhibition
38 plants → 108 test samples → 36 active *in-vitro* → 5 moderately active *in-vivo*

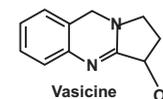
In-silico approach

Genetic improvement for artemisinin content using classical breeding



Vector Control (17 plants)

Anti-malarials from Medicinal and Aromatic Plants



Isolated from *Adhathoda vasica* a developmental inhibitor and insecticidal against *Aedes aegypti*

Chemical Biology Drug Design, 2012, 79: 610-615.
Scandinavian Journal of Immunology, 2011, 74 (6): 522-547.
Malaria Journal, 2010, 9 (Suppl2) : P30
Parasitology Research, 2011 Oct; 109(4): 1003-8.

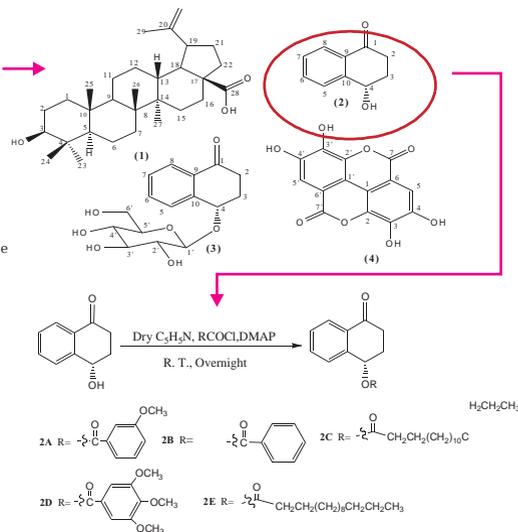
Activity : Detection of antitubercular activity in *Ammannia baccifera*

Input : SK Srivastava, Dharmendra Saikia

Ammannia baccifera
Chinese herbal formulation to cure female infertility, spinal disease, common cold, skin and other diseases.

- 1: Betulinic acid
- 2: 4-hydroxy-a-tetralone
- 3: Tetralone-4-O-β-D-glucopyranoside
- 4: Ellagic acid

Anti-tubercular potential of *Ammannia baccifera* (Linn.)



Anti-tubercular activity

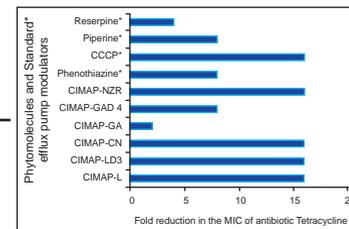
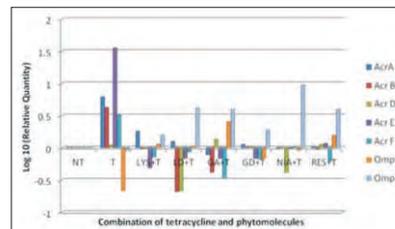


Compound	MIC (µg/ml)
2	50
2B	100
2E	50

Activity : Bacterial efflux pump modulatory effect of phytomolecules

Input : MP Darokar, SK Srivastava, AS Negi

The phenomenon has been exploited for the identification of phytomolecules such as CIMAP-LYS, CIMAP-GA, and CIMAP-NIA that reduced the MIC of antibiotic up to 16 folds by modulating the regulation of genes involved in efflux pump that are responsible for extrusion of antibiotics in Gram-negative bacteria. This will be useful in bringing back old antibiotics which have become non-functional because of acquired resistance by human pathogenic bacteria.



Combined effect of tetracycline and phytomolecules on expression of RND efflux pump and porin forming genes in clinical isolate of *E. coli* analyzed through real time PCR (RT-PCR)

Reduction in the MIC of tetracycline in presence of phytomolecules as compared to known efflux pump modulators

Planta Medica 78: 79-81, 2012 (IF 2.183)

Activity : Development of standardized herbal formulations after shave gel

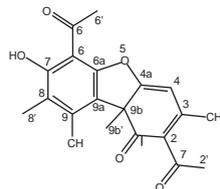
Input : N P Yadav

A unique after shave gel enriched with 100% herbal actives, amalgamation of antimicrobial cooling effect of CIM1166 with rejuvenating effect of *Aloe vera* was developed.



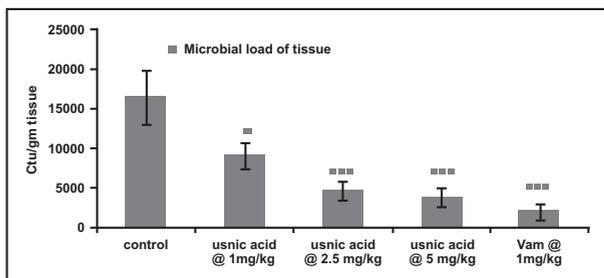
Activity : Usnic acid exerts antibacterial action through membrane disruption in *Staphylococcus aureus*

Input : MP Darokar, SK Srivastava, Anirban Pal

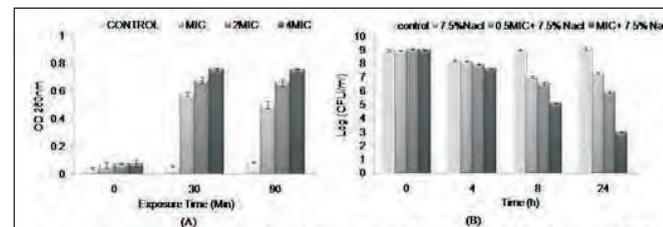


Usnic Acid an anti-MRSA Phytomolecule

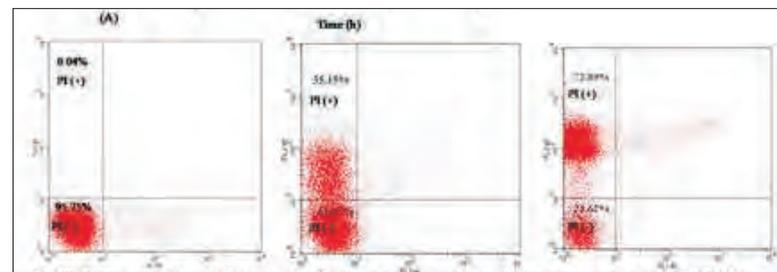
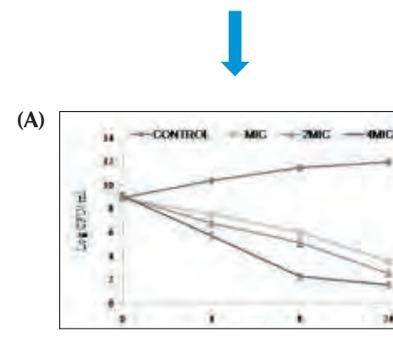
Activity guided fractionation and extraction of fruticose lichen, *Usnea subfloridiana* resulted into a bioactive constituent, usnic acid. Further, therapeutic potential of usnic acid was investigated against clinical isolates of methicillin resistant *Staphylococcus aureus* (MRSA). The MIC of usnic acid against the clinical isolates of MRSA was in the range 25-50 $\mu\text{g}/\text{mL}$. In the cells treated with usnic acid, loss of 260 nm absorbing material and increase in propidium iodide uptake was observed. Similarly, combined effect of the usnic acid and NaCl resulted in reduced number of viable cells. These observations clearly indicate that usnic acid exerts its action by disruption of the membrane. *In-vivo* efficacy showed that usnic acid significantly ($p < 0.0001$) lowered the microbial load and did not exhibit significant toxicity with respect to liver, kidney and lipid metabolism.



Dose dependent *in-vivo* anti-staphylococcus efficacy of usnic acid



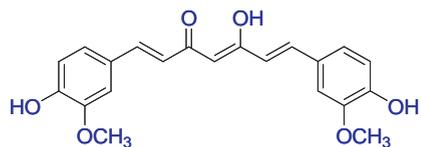
Appearance of 260 nm absorbing material (A) and salt tolerance ability of MRSA-ST 2071 (B) after treatment with usnic acid



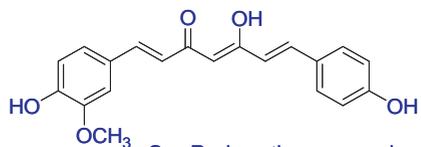
Time kill dynamics (A) and flow cytometry histograms of MRSA-ST 2007 (B) in the presence of usnic acid

Activity : Antimalarial potential of curcumin and its derivatives

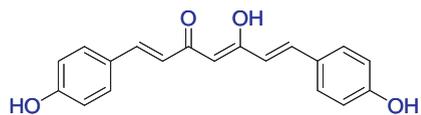
Input : AS Negi and Anirban Pal



Cur-A: Curcumin

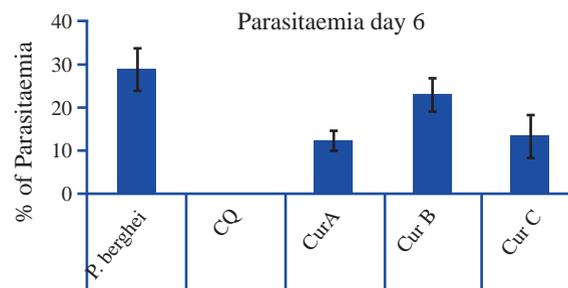
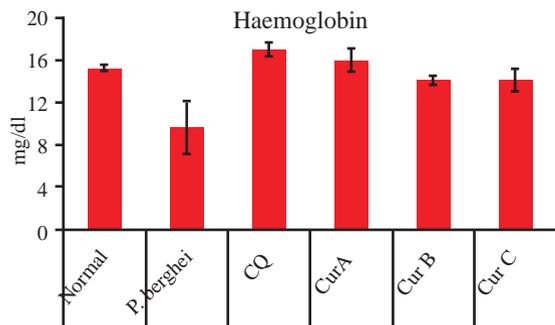
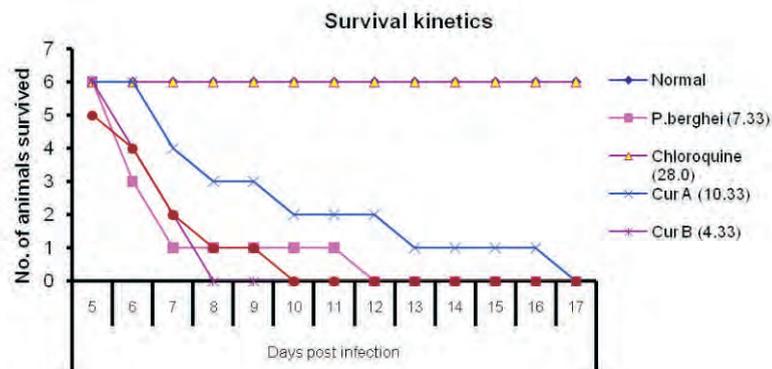


Cur-B: demethoxycurcumin



Cur-C: bisdemethoxycurcumin

Comparative antimalarial potential of curcumin, demethoxycurcumin and bisdemethoxycurcumin at 100 mg/kg bd wt. when compared to chlorofine @ 10 mg/kg against *Plasmodium berghei* (K173) in Swiss albino mice



Activity : Anti-inflammatory effects of P-53 and P-74 isolated from *Pluchea lanceolata* on lipopolysaccharide-induced inflammation in C6 glioma cells

Input : DU Bawankule, Karuna Shanker



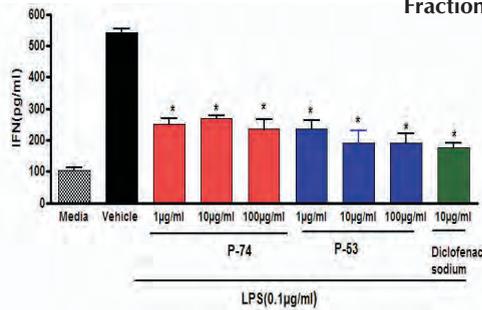
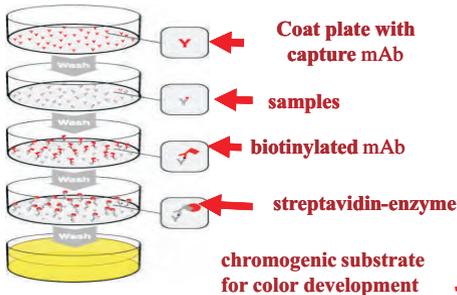
- The *Pluchea lanceolata* is a well-known traditional medicine for various inflammatory diseases.
- The mode of action is still unexplored.

Pluchea lanceolata
(Aerial Part)

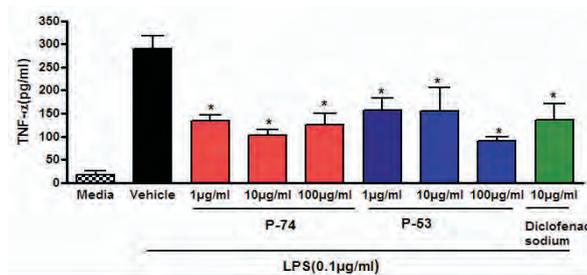
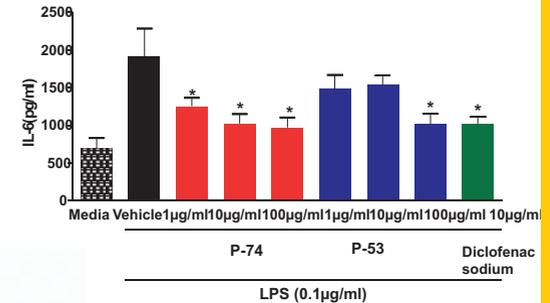
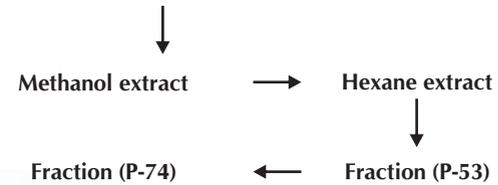
C6 glioma cells

Culture Supernatant

ELISA



Pluchea lanceolata (aerial part)



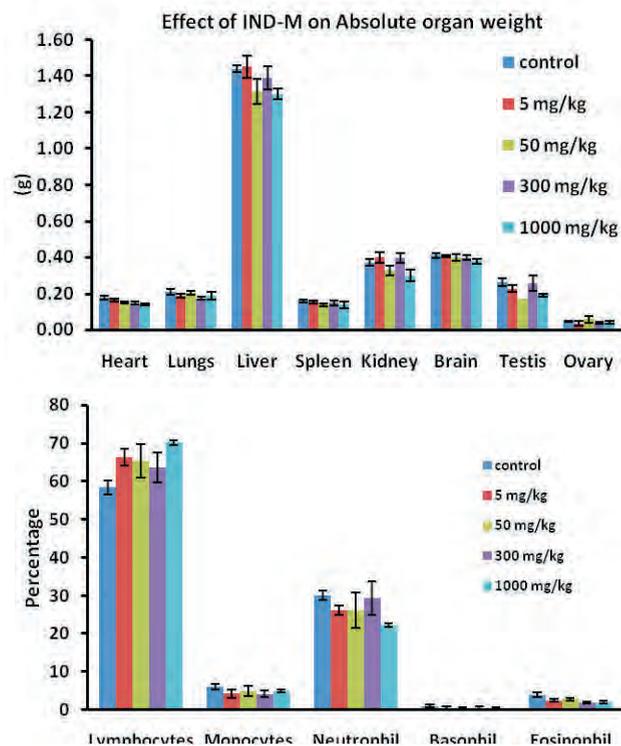
The result of the study demonstrated that the LPS (0.1 μg/ml) stimulation to the C6 rat glioma cells for 24 hr significantly increased the production of inflammatory mediators and pre-treatment of P-53 and P-74 at 1, 10 and 100 μg/ml exhibits the significant (P < 0.05) reduction of inflammatory mediators in a dose-dependent manner. These fractions may further validation in in-vivo models of neuroinflammation-associated disorders.

Activity : Acute oral toxicity study of IND-M in Swiss albino mice

Input : D Chanda, AS Negi

In view of potent anti-cancer activity in *in-vitro* model, acute oral toxicity of IND-M was carried out in Swiss albino mice for its further development into drug product. No observational changes, morbidity and mortality were observed throughout the experimental period upto the dose level of 300 mg/kg body weight and the experiment showed that IND-M is well tolerated by the Swiss albino mice up to the dose level of 300 mg/kg body weight as a single acute oral dose.

Parameters	Dose of IND-M at mg/kg body weight as a single oral dose				
	Control	5 mg/kg	50 mg/kg	300 mg/kg	1000 mg/kg
Body weight (g)	30.42±1.25	30.38±0.77	28.37±1.42	29.35±1.63	30.69±0.83
SGPT (U/L)	9.30±0.89	6.90±0.17	9.77±0.77	9.16±1.14	19.68±1.78a
SGOT (U/L)	20.47±2.07	18.74±1.54	20.66±1.15	26.55±3.23	19.38±3.49
ALKP (U/L)	83.29±9.77	82.51±3.04	94.24±8.83	90.11±5.42	171.12±15.91a
Haemoglobin (g/dL)	13.38±1.00	11.31±1.14	12.93±0.98	11.46±0.76	12.21±1.46
Serum total cholesterol (mg/dL)	116.07±8.86	109.42±5.46	125.69±5.90	117.57±3.45	118.60±6.07
Serum triglycerides (mg/dL)	101.29±5.18	112.69±3.75	90.62±8.41	113.15±3.65	97.44±6.96
Serum creatinine (mg/dL)	0.47±0.06	0.53±0.04	0.45±0.05	0.56±0.07	0.42±0.09

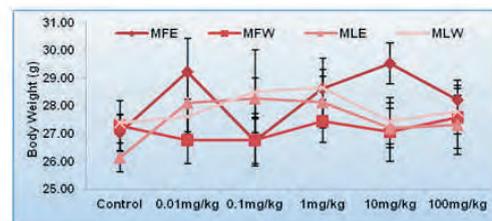
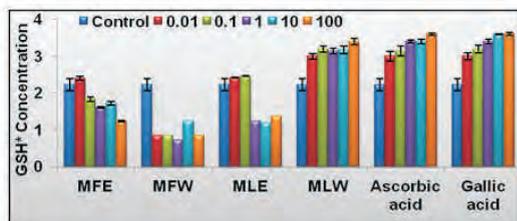


Bioorg. Med. Chem. 20: 3049-3057, 2012, (IF 2.978)

Activity : Experimental assessment of *Moringa oleifera* for different biological activity

Input : Suaib Luqman

A concentration dependent effect of aqueous extract of *Moringa oleifera* leaves on markers of oxidative stress exhibited increased GSH and reduced MDA level whereas ethanolic extract of fruit showed highest phenolic content, strong reducing power and free radical scavenging capacity.



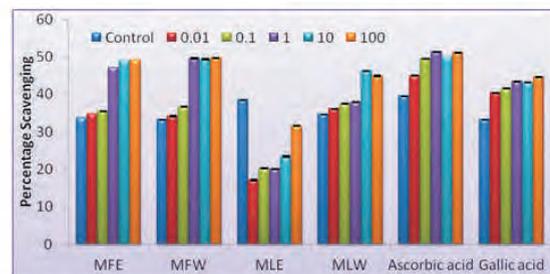
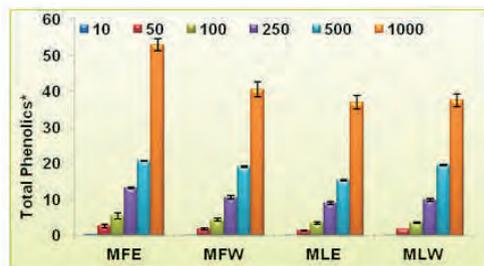
Protective Effect on Markers of Oxidative Stress

Safety Evaluation

Moringa oleifera
Leaves and Pod
Aqueous and Ethanolic
Fractions

Total Phenolics

Radical Scavenging



Evidence-Based Complementary and Alternative Medicine: 519084, 2012
Current Chemical Biology, 5 (3): 213-218 (IF 2.964), 2011

Activity : Biofuel and bio-chemicals from MAPs spent/distillation waste

Input : PK Rout, AD Nannaware

MAPs farmers in India produced >6million tons of spent biomass. CSIR-CIMAP initiated project on conversion of this waste in valuable bio-chemicals (Indian Patent No.:228NF2011).

- New treatment process for isolation of cellulose from spent biomass.
- New economical green process for producing hydroxymethyl fufural from cellulose.
- Hydroxymethyl furfural is a potential bio-precursor molecule for bio-fuel, bio-polymer, bio-pesticides and synthetic chemicals.



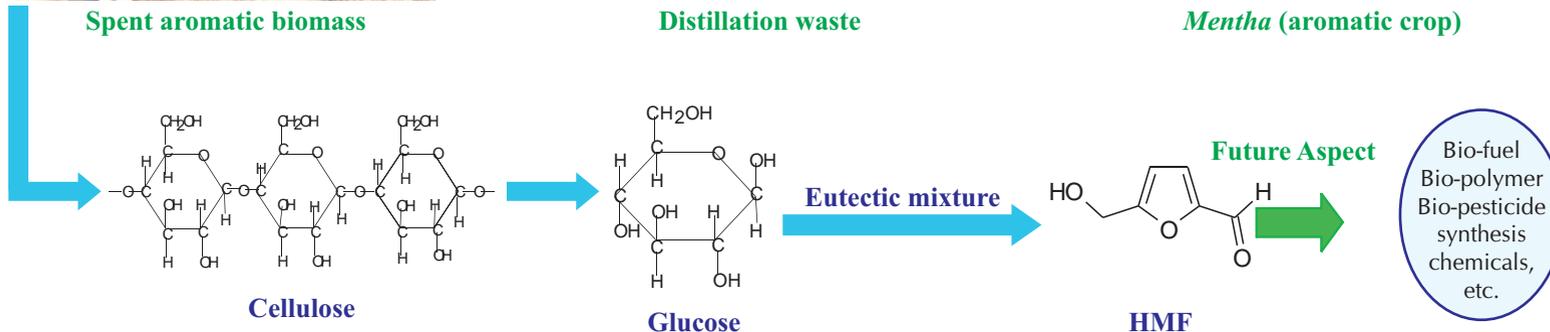
Spent aromatic biomass



Distillation waste

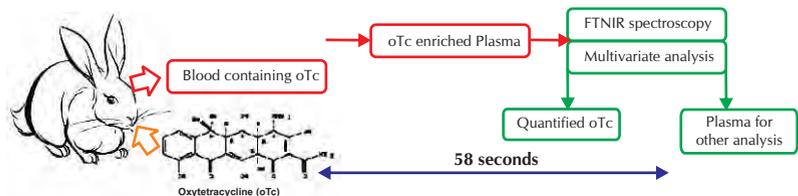


Mentha (aromatic crop)



Activity : Non destructive, instant and green method for quantification of oxytetracycline (oTc) from plasma

Input : PV Ajaykumar, D Chanda and Anirban Pal



Oxytetracycline (oTc) is one of the most common anti-biotics in use, was considered for the development of a quick, non destructive method through FTNIR spectroscopy. oTc was orally administered to rabbit and blood was collected at various time points for analysis through FTNIR and its validation through HPLC. The multivariate analysis could significantly assess the quantity of oTc in plasma. The method can now be utilized for pharmacokinetic interaction studies with herbal bioactives.

Advantages :

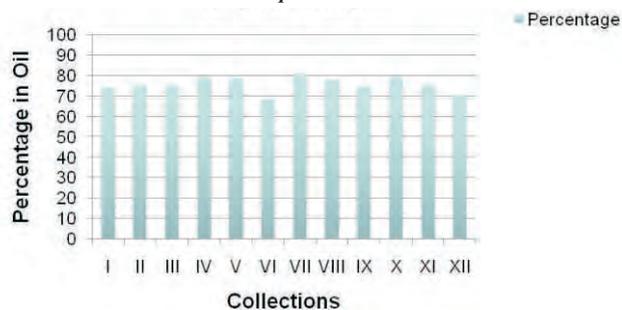
- No matrix extraction process
- No solvents used
- Plasma can be re-used immediately for other biochemical parameters
- Extremely quick

Activity : Chirality of camphor enantiomers in *Cinnamomum camphora* essential oil

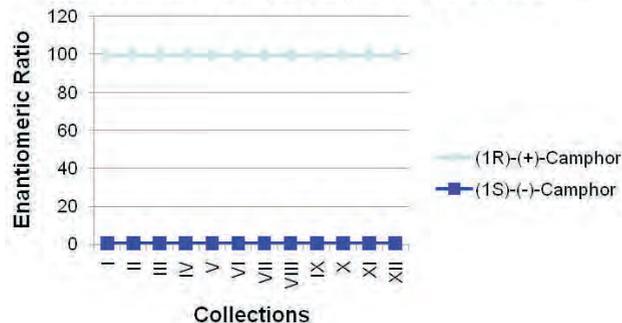
Input : CS Chanotiya and Anju Yadav

Chirality of camphor enantiomers in *C. camphora* essential oil was analytically examined over a year and it was observed that enantiomeric ratio of (1R)-(+ and (1S)-(-) camphor was 99:1, which happens to be different from synthetic camphor.

a. Seasonal variation of camphor content in *C. camphora* leaves



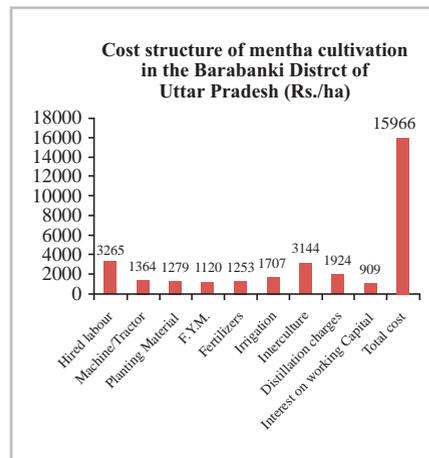
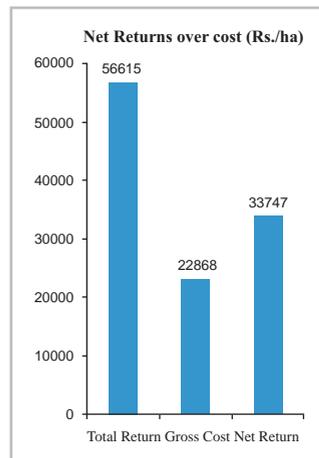
b. Enantiomer ratio of camphor in *C. camphora*



Activity : Economic analysis of menthol mint at farmer's field

Input : Sanjay Kumar, Ram Suresh, Virendra Singh and AK Singh

The study carried out in the Barabanki district of Uttar Pradesh has shown that the major portion of operational cost is shared by hired labour, interculture operations, distillation charges, irrigation and machine / tractor charges. The overall benefit - cost ratio has been found to be 2.55, which indicates a higher profit for farmers with lesser investment in mint cultivation. The independent variables like human labour, machinery, manures and fertilizer, irrigation charges and intercultural operations have shown a positive and significant impact on the returns of mint crop in the study area. The major problems faced by the farmers were high input cost, erratic supply of electricity, lack of adequate information, infrastructural facilities, regulated markets and energy - efficient distillation units.



(Gross cost Rs.22868/- include interest on capital assets + rental value of own land+ family labour)

Agricultural Economic Research Review 24: 345-50, 2011

Activity : CSIR- CIMAP Kisan Mela

Input : Sanjay Kumar, AK Singh, VKS Tomar, RP Bansal, Alok Krishna, Ram Suresh

CSIR-CIMAP-Kisan Mela was organized on 31st January, 2012 at Lucknow in which about 1500 farmers including women and entrepreneurs from different parts of the country participated. On this occasion, consultancy agreements were signed with M/s Emami Biotech Limited, Kolkata and M/s. IPCA lab, Ratlam.



Exchange of agreement with Emami Biotech



Exchange of agreement with IPCA Lab

Activity : Consultancy/Technical Services

Input : Sanjay Kumar, VKS Tomar, AK Singh, Ram Suresh

Consultancy services to four firms namely, M/s Emami Biotech Limited, Kolkata (WB), M/s IPCA Lab, Ratlam (MP), Divisional Forest Office Renukoot (UP) and NIIST, Thiruvanthapuram were rendered. An amount of Rs approx. 31.0 lakhs was received as consultancy fee.

Activity : Entrepreneurial trainings

Input : Sudeep Tandon

Entrepreneurial Training-cum-Workshop on Essential Oil

Processing Technologies (EOPT - 2011)

A six day hands on entrepreneurial training cum workshop on essential oil processing technologies (EOPT-2011) for budding entrepreneurs interested in setting up of units for processing and value addition of essential oils was organized from 23rd - 28th May 2011. Twelve participants from the states of Karnataka, Andhra Pradesh, Manipur, Delhi and UP participated in the workshop.

Entrepreneurial Training-cum-Workshop on *Aloe vera*

Processing (AVPT - 2011):

Input : Sudeep Tandon

A four day hands on entrepreneurial training workshop (AVPT-2011) for budding entrepreneurs interested in setting up of units for processing of *Aloe vera* for juice, sap and gel was organised from 20-23 December 2011. Twenty five participants from the states of Bihar, Rajasthan, Maharashtra, Andhra Pradesh and UP attended the program.

Entrepreneurial training for the residents of Uttarakhand

Input : AK Singh, Sanjay Kumar and Team

Four training programs on MAPs cultivation and processing were organised for Uttarakhand region for approximately 100 participants.

Entrepreneurial training for women

Input : RP Bansal, AK Singh

Two training programs for women were organised in Lucknow in which 34 participants attended.

Farmers' training programme

Input : VKS Tomar, Alok Krishna, AK Singh, Sanjay Kumar, Ram Suresh

Sixteen training programmes in different districts namely Lucknow, Barabanki, Jabalpur, Nagaon, Churachandrapur and Kopergaon were organised. A total of 790 persons attended.

Survey and feedback studies

Input : Alok Krishna

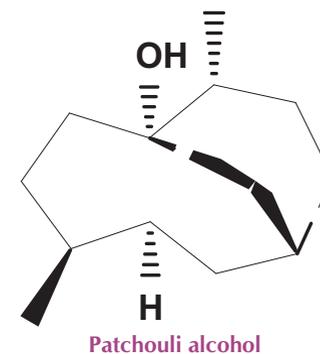
Conducted survey of organic tulsii growing area in Rath Hamirpur, Uttar Pradesh and interacted with more than 300 growers for data collection on cultivation and economics along with constraints faced by the farmers.

Conducted survey of rainfed area of Jhansi, Bundelkhand, Uttar Pradesh for collection of soil samples from more than two dozen farmers for microbial biodiversity and status of NPK and other micronutrients studies in soil for possible recommendations for MAPs cultivation.

Activity : Chemical diversity in *Valeriana jatamansi* essential oil

Input : RS Verma

To explore variability in the essential oil yield and composition of Indian Valerian (*Valeriana jatamansi*) growing wild in Uttarakhand, seventeen populations were collected from different locations and grown under similar conditions. Comparative results showed considerable variations in the yield (0.21% to 0.46%) and composition of root essential oils. The chromatographic analysis of the oils and subsequent classification by principal component analysis (PCA) enabled to make six clusters with significant variations. Major components in the essential oils of the different populations were patchouli alcohol (13.4-66.7%), α -bulnesene (<0.05-23.5%), α -guaiene (0.2-13.3%), guaioi (<0.05-12.2%), seychellene (0.2-9.9%) viridiflorol (<0.05-7.3%), and β -gurjunene (nil-7.1%).



Chemistry & Biodiversity, 8 (10),1921-1929, 2011 (IF 1.586)

Activity : Comparative composition of root and rhizome essential oils of *Valeriana jatamansi*

Essential oils derived from the roots and rhizomes of the *Valeriana jatamansi* were compared for their chemical compositions. The amount of patchouli alcohol (48.7-55.1%), viridiflorol (0.9-2.1%), and isovaleric acid (3.1-5.0%) was observed to be higher in rhizome oil, whereas amounts of the α -bulnesene (12.0-13.1%), α -guaiene (8.7%), sechellene (4.8-5.9%), α -patchoulene (2.3-2.5%), bornyl acetate (1.9-2.3%), and α -patchoulene (1.5-1.7%) were relatively higher in root oil.

Activity : Assessment of similarities and dissimilarities in the essential oils of Patchouli and Indian Valerian

Two chemically alike essential oils derived from two disjunct genera, viz. patchouli (*Pogostemon cablin*) and Indian Valerian (*Valeriana jatamansi*) were investigated for identification of marker compounds. In spite of huge chemical resemblance (78.5-90.3%) these two essential oils can be authenticated by their characteristics minor or trace constituents. The marker constituents identified for *P. cablin* oil were pogostone, pogostol, and (Z)-thujopsene, whereas marker constituents for *V. jatamansi* oil were 3-methyl valeric acid, thymol methyl ether, carvacrol methyl ether, bornyl acetate, kessane, maaliol, xanthorrhizol, and 8-acetoxy patchouli alcohol. These constituents may be utilized as an important tool in oil authentications.

V International Conference on Vetiver (ICV-5)

International Conference on Vetiver was organised for the first time in India at CSIR-CIMAP, Lucknow from 28-30 October 2011. It was fifth in the series with the conference theme "Vetiver and Climate Change". As a pre-conference activity, the Chairperson of The Vetiver Network International (TVNI) the Her Royal Highness Princess Maha Chakri Sirindhorn of Thailand planted two Thai endemic plants named after her, namely Champee Sirindhorn (*Magnolia sirindhorniae* Noot. & Chalermglin) and Sirindhorn Walli (*Bauhinia sirindhorniae* K. & S.S. Larsen), at the CSIR- Central Institute of Medicinal and Aromatic Plants, Lucknow and also at the CSIR-National Botanical Research Institute, Lucknow on 27th October 2011.

The opening ceremony of the conference was held on 28th October at CSIR-CIMAP with Her Royal Highness Princess Maha Chakri Sirindhorn as the Chief Guest who declared open the Conference. In her inaugural address she pinpointed the newer roles, including application of 'Vetiver Grass Model' in mitigating the atmospheric carbon in addition to the significant impact the Vetiver System has made in solving various environmental problems and mitigating the adverse effect of climate change. She expressed that brainstorming during the conference, apart from discussing and viewing the latest applications of the Vetiver System Technology, shall advance further to the next step that would lead to great benefit to all mankind.

On this occasion Prof. Ram Rajasekharan, Director CSIR-CIMAP released a seed infertile autopolyploid clone of Vetiver named "Khus-40" developed at CIMAP, Lucknow. This clone has value in ecological plantations for soil conservation and carbon sequestration. The Conference was attended by over 90 foreign delegates representing 20 countries and 70 Indian participants. The delegates included leading practitioners, experts, and policy makers associated with Vetiver System applications from all over the world. There were 70 oral and 30 poster presentations, including lead Plenary lectures by the international experts and Award winners, covering the theme areas : (i) Climate Change and potential contribution of the Vetiver System, (ii) Infrastructure protection and pollution control, (iii) Recent global innovations in R & D and its applications, and (iv) Other contributions to Vetiver System, relating to Vetiver oil and processing, economic and social uses of vetiver by-products, general aspects and basic studies. The book of abstracts, unedited proceedings, and powerpoint presentations made at the ICV-5 are available on www.vetiver.org. The book of abstracts (Souvenir) contains messages from lead vetiverites who have pioneered and championed the cause of Vetiver System applications in a global perspective. In addition to interactive deliberations, one of the unique attraction of the Conference was vetiver handicrafts training class. The host institute CIMAP instituted ICV-5 poster awards were given to the five best posters presented during the conference.

The conference concluded with specific recommendations emphasizing the need to : (i) Develop right kind of plant material for specific applications, (ii) Participation of public-private partnership and involvement of youth force for implementation, (iii) Establishment of bioengineering standards, (iv) Documentation of C-sequestration and water recharge, bioenergy and phytoremediation potential of vetiver system technology, (v) Synthesis of available information in simple way and local languages for dissemination, (vi) Strong follow-up of the deliberations of the conference, take advantage of Dick Grimshaw's blog, (vii) Development of economic model for benefit sharing with local communities. It was announced that next ICV-6 shall be held in Da Nang, Vietnam in 2014 on the theme "Vetiver and Energy"



The 80th Annual Meeting of the Society of Biological Chemists (SBC), India

The 80th Annual Meeting of the Society of Biological Chemists (India) on the theme Metabolic Pathway Modulations - "Applications in Health and Agriculture" was organized at CSIR-CIMAP, Lucknow from 12-15 November 2011. The presidential address was delivered by Prof. V.Nagaraja on the topic "Design of restriction enzyme active site plasticity-evolution of new functions". The conference was spread in eight technical sessions under the themes of Genes and Gene regulation, Macromolecules-Structure and Function, Biofuel, Bioengineering and Technology, Clinical Biochemistry, Metabolic Pathways and Engineering, Systems Biology, Disease Biology, Plant Biochemistry, Immunology, Molecular Nutrition, Cellular Signalling, Microbial Technologies, Plant Growth and Development, Stress Physiology with oral and poster sessions. The I.S. Bhatia memorial award was conferred to Prof. Ram Rajasekharan on the topic "Triacylglycerol (oils and fats) biosynthesis in eukaryotes". The conference was attended by about 600 participants covering almost all the regions of the country.

Research Publications

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Patents granted

SN	Title	Inventors	Country	Patent Number	Grant Date
1	A novel method for one pot conversion of artemisinin into arteether The present invention provides a method for the preparation of arteether from artemisinin in one pot in just about 4 hours comprising reduction of artemisinin into dihydroartemisinin by less quantity of sodium borohydride in ethanol at room temperature in the presence of a novel polyhydroxy catalyst.	RS Bhakuni Amit Tiwari Tarun Singh SPS Khanuja	Canada	2507078	12.4.2011
2	Composition and process for preparing herbal disinfectants and their use. The invention relates to development of the disinfectants that are non-toxic, biosafe and in addition give pleasant odour. The disinfectants already available in the market contain harmful chemicals such as formaldehyde, ethane dialdehyde, n-propanol, benzalkonium chloride, phenol and the like. The present invention relates to disinfectant compositions for cleaning the skin of humans and for cleaning surfaces such as floors. The compositions are homogeneous, clear and also useful as disinfectant. The invention also provides a process for the preparation of the cleaning composition. The compositions are prepared by mixing the components in a particular well-defined order to obtain clear, transparent solutions effective against pathogenic bacteria and fungi.	SPS Khanuja MP Darokar TRS Kumar AK Shasany KK Agarwal Atique Ahmed P. Chaturvedi V K Gupta Alok Krishna AK Singh JR Bahl RP Bansal Dinesh Kumar	Canada	2480330	3.5.2011
3	Formulation useful as a nitrification and urease inhibitor and a method of producing the same The invention relates to a novel formulation useful as nitrification and urease inhibitor, said formulation comprising an effective amount of nitrogenous fertilizer, castor oil and oil derived from <i>Artemisia annua</i> in an amount sufficient to enhance the nitrification activity of the formulation, a method for producing the formulation and method for applying the same to soil.	DD Patra Usha Kiram M Anwar S Chand Sushil Kumar	AR	029470	21.7.2011

4	<p>Process for the isolation of compound scopolamine useful as nitric oxide synthesis inhibitor. The invention relates to the development of a significantly economic process for the isolation of compound scopoletin (which is used as nitric oxide synthesis inhibitor) from stem parts of <i>Artemisia annua</i> and other plant families.</p>	<p>DC Jain Neerja Pant MM Gupta RS Bhakuni RK Verma S Tandon SK Gupta AP Kahol Amit Tewari Sushil Kumar</p>	Japan	4815041	2.9.2011
5	<p>A synergistic formulation leading to enhancement of bio-activity of antifungal agents. The present invention relates to a method of treatment of fungal infections consisting essentially of a synergistic combination of plant compounds that are useful for enhancing the activity of antifungal compounds. The plant compounds, menthol and menthyl acetate, when mixed at specific concentrations, enhance the antifungal activity of the commercially available fungicides. This phenomena of the enhancement of the antifungal activity by the essential oil components at a very low concentration and specific ratios can revolutionize antifungal consumption and reduce the drug price in the market. Toxicity of the antifungal drugs is also reduced to the accepted levels of dosage alongwith enlargement of antimicrobial spectrum of the drug and prevention of drug resistance.</p>	<p>SPS Khanuja P Chatruvedi KK Agarwal Atique Ahmad TRS Kumar MP Darokar AK Shasany JS Arya Sushil Kumar</p>	Canada	2479381	1.11.2011
6	<p>Use of phyllocladane diterpenoids for plant growth promotion and alleviation of growth retardant allelochemicals. The invention provides plant growth-promoting activities of active plant constituent calliterpenone and its derivatives belonging to the group phyllocladane diterpenoids. These phytochemicals and derivatives exhibit remarkable growth promoting activities on plant roots, shoots and promote seed germination both in mono and dicotyledonous plants. These phytomolecules possess antagonistic activity against allelochemicals of plant growth retardant nature and hence can be used to alleviate their detrimental effects.</p>	<p>AK Singh GD Bagchi Sarita Singh PD Dwivedi AK Gupta SPS Khanuja</p>	Canada	2510132	15.11.2011

7	<p>A novel plant growth promoting naphthophenone derivative from Gallic Acid.</p> <p>Plant growth regulatory activity of a gallic acid derivative, a new synthetic molecule methanone-(3',4',5'-trimethoxy) phenyl, 1-naphthyl, 2-O-4"-ethyl but-2"-enoate has been established. The invention also provides a novel and economical process for preparation of said molecule from a naturally occurring compound and testing it for growth regulating activity using Bacopa test system developed at CIMAP (Khanuja <i>et al.</i>, 2001). The molecule is light yellow oil having molecular formula $C_{26}H_{26}O_7$.</p>	<p>AS Negi MP Darokar SPS Khanuja SK Chattopadhyay Ankur Garg T Padmapriya Sachin Srivastava AK Shasany AK Bhattacharya</p>	India	250039	30.11.2011
8	<p>Novel loganin analogues and a process for the preparation thereof.</p> <p>The invention relates to novel loganin analogues and a process for the preparation thereof, particularly use of iridoid glycoside loganin isolated from the fruit pulp of <i>Strychnos nux-vomica</i> and its bioactive semi-synthetic analogues against various human cancer cell lines grown in-vitro.</p>	<p>SPS Khanuja SK Srivastava Ankur Garg Merajuddin Khan MP Darokar Anirban Pal</p>	India	251579	26.3.2012

Research Council

Chairperson

Prof. Asis Datta

Professor of Eminence
National Institute of Plant Genetic
Resources (NIPGR), New Delhi

External Members

Dr. Vivek Bhandari

Director
Institute of Rural Management, Anand

Dr. C.C. Lakshmanan

Chief Scientist & R&D Head
Research & Technology Innovation
ITC R&D Centre, Bengaluru

Prof. Sudip Chattopadhyay

Department of Biotechnology
National Institute of Technology
Durgapur

Mr. K. Rahul Raju

Joint Managing Director
Nagarjuna Fertilizers & Chemicals Ltd.
Hyderabad

Prof. A. Srikrishna

Professor
Organic Chemistry Division
Indian Institute of Science, Bengaluru

Agency Representative

Dr. (Mrs.) Vinita Sharma

Adviser & Head
Science for Equity, Empowerment &
Development (SEED) Division
Department of Science & Technology
New Dehli

DG's Nominee

Dr. Ramesh V. Sonti

Scientist
CSIR-Centre for Cellular and Molecular Biology
Hyderabad

Sister Laboratory

Dr. Ram A Vishwakarma

Director
CSIR-Indian Institute of Integrative Medicine
Jammu

Cluster Director

Dr. PS Ahuja

Director
CSIR-Institute of Himalayan Bioresource Technology
Palampur

Director

Prof. Ram Rajasekharan

Director
CSIR-CIMAP
Lucknow

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Scientist
CSIR-CIMAP
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Management Council

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Director
CSIR-CIMAP, Lucknow

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Director
CSIR-Central Drug Research Institute, Lucknow

Dr KP Sastry, Scientist

CSIR-CIMAP Research Centre, Hyderabad

Mr. Rakesh Tiwari, Scientist

CSIR-CIMAP, Lucknow

Dr AS Negi, Scientist

CSIR-CIMAP, Lucknow

Dr RP Bansal, Scientist

CSIR-CIMAP, Lucknow

Dr V Sundaresan, Scientist

CSIR-CIMAP, Lucknow

Dr SK Srivastava, Library Officer

CSIR-CIMAP, Lucknow

Mr. US Rawat

Controller of Finance & Accounts
CSIR-CIMAP, Lucknow

Mr. Dharendra Kumar

Controller of Administration
(Member Secretary)
CSIR-CIMAP, Lucknow

Budget At A Glance

	Rupees in Lakhs
Pay & Allowances	2008.318
Contingencies (P-04)	215.244
H.R.D. (P-05)	2.000
Lab Maintenance (P-06)	157.370
Staff QRS, Maintenance (P-701)	19.874
Chemicals/Consumables & Other Research Expenditures (P-07)	405.380
Works & Services (P-50)	109.233
Apparatus & Equipments - Scientific (P-50)	416.000
Office Equipments (P-50)	2.996
Furniture & Fittings (P-50)	3.631
Library Books (P-50)	2.959
Library Journals (P-50)	96.761
Staff Qtrs. (Construction) (P-702)	17.500
CSIR Network Projects	441.387
Total	4340.04
Pension (P804)	655.470
EMR (P81)	160.741
External Budgetary Resource	
Lab Reserve Fund (LRF)	71.89
External Cash Flow (ECF)	262.30

Staff Members (As on 31.3.2012)

Director

Prof. Ram Rajasekharan

Chief Scientist

Dr UC Lavania

Dr A K Singh

Dr BRR Rao

Dr RN Kulkarni

Dr DD Patra

Dr LN Mishra

Dr Mansoor Alam

Dr AK Singh

Dr SK Chattopadhyay

Dr MM Gupta

Dr D Singh

Dr Ashok Sharma

Dr KP Sastry

Senior Principal Scientist

Shri Anil Kumar

Dr KV Shyamsunder

Dr AK Kukreja

Dr AK Mathur

Dr AK Singh

Dr GD Bagchi

Dr NK Srivastava

Dr RS Sangwan

Dr SK Srivastava

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Dr Alok Kalra

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Dr HN Singh

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Dr JR Bahl

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Dr (Mrs) Archana Mathur

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Dr AK Shasany

Dr Saudan Singh

Dr Alok Krishna

Principal Scientist

Dr Ved Ram Singh

Dr RS Bhakuni

Mr. Sudeep Tandon

Mr. MP Darokar

Dr AS Negi

Dr Birendra Kumar

Dr AK Gupta

Dr (Ms.) Malathi Srinivasan

Mr. Dharmendra Saikia

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Senior Scientist

Dr Vikrant Gupta

Dr Rakesh Pandey

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Dr Dayanandan Mani

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Dr Sanjay Kumar

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Dr DU Bawankule

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Dr PK Rout

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Dr Debabrata Chanda

Dr (Ms) Puja Khare

Dr Rakesh K. Shukla

Dr (Ms.) Tripta Jhang

Junior Scientist

Ms. Abha Meena

Dr Atul Gupta

Dr Ram Suresh

Mr. D Nannaware

Dr. Sreedhar R. V.

Group-III

Principal Technical Officer

Dr SK Srivastava

Dr NS Ravindra

Dr VK Agarwal

Dr HP Singh

Mr. S. Tahir Husain

Sr. Technical Officer (3)

Dr Man Singh

Mr. Sushil Kumar

Dr Mohd Zaim

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Dr SC Singh

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Sr. Technical Officer

Mr. Krishna Gopal
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Sr. Technical Officer (1)

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Sr. Technical (2)

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Mr. Phool Chand
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Sr. Technician (1)

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Administrative Staff (Group-A)

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Mr. Ravindra Kumar

Group-B

Mr. SM Kushwaha
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Asst F & A Grade-III

Mr. Pradeep Kumar
Ms. Farzana Hafeez

Asstt S & P Grade-III

Mr. Ajeet Verma

Junior Stenographer

Mr. Kaushal Kishore
Mr. Siddharth Shukla

Group C (Non-Tech)

Mr. AK Srivastava
Mr. CS Pant

Isolated Posts

Mr. Yograj Singh
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Ms. Sangeeta Tanwar

Drivers PB-1

Mr. Ajay Kumar Verma
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Mr. Zarina Bano
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Mr. Abdul Nadir Khan
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Published by : Director, CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow

Concept* : Prof. Ram Rajasekharan

Editing : Rakesh Tiwari, HP Singh

*of graphical presentations/abstracts of research work in Annual Report



CSIR- Central Institute of Medicinal and Aromatic Plants
(Council of Scientific and Industrial Research)
Kukrail Picnic Spot Road, Lucknow-226 015