Three new molecules including two triterpenoids Potentene A, Potentene B and one biflavonoid Potifulgene along with one known flavone and three flavanols were isolated from the aerial parts and roots of *Potentilla fulgens*. In addition hexane, ethylacetate, n-butanol extracts and the isolated compounds were screened for their DPPH radical scavenging antioxidant activity. The results showed that *Potentilla fulgens* is a new source of natural antioxidants.

The essential oil composition of *Artemisia maritima*, *Artemisia capillaris* and *Heracleum thomsonii* was studied in detail and screened for their bioassay showing moderate to broad antimicrobial activities against different microrganisms. Results indicated that all the oils have potential applications in preservation of food and medicine. Moreover, these oils have potential as new and alternate natural fragrance materials useful for blending and in the manufacture of new cosmetic products.

One pot simple and efficient method was developed for the synthesis of double, triple Michael and Thorpe-Ziegler condensation reaction of aryl methyl ketones in consecutive manner. Double Michael products were used for tetrazole synthesis having versatile application as bidented ligands. In addition, a regioselective, cost effective, atom economic and environment friendly Claisen-Schmidt condensation reaction by catalyst alkali exchange macroporous anionic resin was developed which is applicable separately at two active positions of cyclic and acyclic ketones. The catalyst is reusable 4-5 times without loss of its activity.

An efficient 1,4-intermolecular transglycosylation of stevioside was carried out with β-CGTase (β-Cyclomaltoextrinlcucanotransferase) in presence of β-cyclodextrin (β-Cyclomaltoextrin) as glucose donor was successfully accomplished for the first time under microwave conditions in 1min. The objective of the biotransformation reaction was to remove aftertaste bitterness in stevioside by transglycosylation. CGtase from *alkalophilic Bacillus firmus* was found an effective biocatalyst in transglycosylation and exhibited specific property of higher transglycosylation rate under MAR (Microwave-
assisted reaction) system. MAR proved to be rapid and convenient technique, resulting in optimum yields of two α-glycosylated biotransformed products in 65% and 25% respectively. This technique is environment friendly and offers fast alternate to conventional and ultrasound methods with enhanced transglycosylation yields. It operates at low energy cost and has potential for commercial production of modified de-bittered stevioside. A fast and convenient High performance thin layer chromatography (HPTLC) method was developed for the first time for screening large number of plant samples and monitoring of major steviol glycosides at different stages during commercial production and quality control of the steviosides. Microwave-assisted extraction was also developed for the extraction of major steviol glycosides in *Stevia rebaudiana*. MAR is a fast, cost effective and enviornment friendly technique.