63rd International Congress and Annual Meeting of the Society for Medicinal Plant and Natural Product Research (GA2015)

Budapest, Hungary, 23 - 27 August 2015

dendrimer. Dendrimers are core-shell nanostructures with precise architecture and low polydispersity, which are synthesized in a layer-by-layer fashion ("generation") around a core unit, resulting in high level of control over size, branching points and surface functionality. The new PAMAM dendrimer was synthesized through divergent method, using benzylamine and methylacrylate, followed by the synthesis of the amide with ethylendiamine and finally a Michael addition with methylacrylate [1]. Size was 176.7±7.3 nm, a Pd was 0.33±0.06. According to TEM, globular shape dendrimer aggregates of 96.66 nm are present. Curcumin complexation did not affect the structure of dendrimers. Encapsulation efficiency and loading capacity were very satisfactory, 88% and 21% respectively. Stability of curcumin complexed with the dendrimer was evaluated by HPLC and resulted satisfactory during three months analysis. The release studies of curcumin from dendrimer showed a slow release profile, which is essential for a sustained and prolonged activity. Dendrimer did not show cytotoxicity in MCF-7 cells while curcumin had an IC_{50} of $3x10^{-5}$ M. Studies with the complexed formulation are ongoing.

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PM-241

Polyphenol content and free radical scavenging activity of bee pollen collected in Castelo Branco, Portugal

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Bee pollen is a health food with nutritional and therapeutic properties.The aim of this work was to evaluate free radical scavenging activity (FRSA) in selected samples obtained from local beekeepers in Castelo Branco (Portugal). The identification of the floral origin was performed using acetolysis method.

Each sample of bee pollen (0.10 ± 0.01 g) was extracted with methanol, ethanol and water [1, 2] to evaluate which solution provided the best extract. All the experiments were analysed in quadruplicate. The total polyphenols content of bee pollen was analysed using

spectrophotometry at 725 nm using the Folin–Ciocalteu reagent with Ferulic acid as a standard. FRSA was evaluated according to the DPPH $^{\bullet}$ and ABTS $^{\bullet+}$ methods.

In relation to the content of total polyphenols, the FRSA values varied considerably. Different floral species present species-specific activity [1] but these are dependent on the analytical method and the extraction solvent. On average, the highest polyphenol content was observed in methanol bee pollen extracts with the exception of the mixture B and the *Echium* sp pollen (Table 1). For the total FRSA with DPPH and ABTS methods, ethanol pollen extracts show higher activity with the exception of *Trifolium* spp. where the aqueous extract gives the higher result (Table 1). Mixture B and C ethanolic extracts give the best FRSA values.

The ANOVA shows for the three methods that there are significant differences between solvent extracts and protocols, however the variation between the solvent extracts is similar in the different procedures.

[1] *Campos MG, Webby RF, Markham K R, Mitchell Kevin A, Cunha AP*. Age-induced diminution of free radical scavenging capacity in bee-pollens and the contribution of constituent flavonoids.J. Agric. Food Chem. 2003; 51:742-745

[2] *Pérez-Pérez EM, Vit P, Rivas E, Sciortino R, Sosa A, Tejada D, Rodríguez-Malaver AJ*. Antioxidant activity of four color fractions of bee pollen from Mérida, Venezuela. Archivos Latinoamericanos de Nutrición 2012; 62(4):375-380

Table 1 - Polyphenol content and free radical scavenging activity of pollen extracts in different solvents

	Extract	*Echium* sp	*Trifolium* spp.	*Mixture A*	*Mixture B*	*Mixture C*
Polyphenol content (FAE/100 g pollen)	Water	51.38±0.21cB	29.85±0.17aA	86.75±0.19bE	72.90±0.18aD	62.50±0.12bC
	Ethanol	29.63±0.17aC	86.30±0.12bE	42.08±0.25aD	11.60±0.16aB	10.70±0.12aA
	Methanol	45.93±0.15bA	86.75±0.19bC	118.20±0.12cD	61.93±0.26bB	86.38±0.28cC
% DPPH Inhibition	Water	12.03±0.59aA	8.13±0.36aA	30.26±1.04aC	21.05±0.79cB	25.24±0.83bB
	Ethanol	10.78±0.45aC	41.62±1.11bE	28.03±2.23aD	4.02±0.30aA	2.53±0.12aA
	Methanol	11.72±0.24aA	61.91±1.51cC	64.30±2.84bC	15.68±0.98bA	45.09±1.74cB
% ABTS Inhibition	Water	17.10±0.67bA	20.38±0.72aB	37.37±0.67bD	33.89±1.63cC	32.82±0.76bC
	Ethanol	13.39±0.47aB	24.89±0.57bD	18.31±0.63aC	6.51±0.32aA	6.11±0.07aA
	Methanol	17.00±0.30bA	39.93±1.24cC	38.63±1.37bC	22.47±0.61bB	37.24±1.25cC

a, b, c mean values with different letters in a column for each method differ statistically ($p < 0.05$); A, B, C, D, E mean values with different letters in a line differ statistically ($p < 0.05$).
Mixture A: *Cistus* spp.; *Quercus* spp.; *Olea* spp; *Brassica* spp., *Raphanus* spp.; ***Mixture B***: *Taraxacum* spp.; *Andryala* spp.; *Cistus* spp.; *Rhamnus* spp.; ***Mixture C***: *Cistus* spp. (majority); *Crepis* spp.; *Trifolium* spp. (minority).