Commentary

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Jerusalem artichoke (*Helianthus tuberosus* L.) Use in the Poultry Farms

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Jerusalem artichoke JA, (*Helianthus tuberosus* L.), belongs to the Compositae family of perennial vegetable crops. It is re-grown annually in Iraq and many countries because, normally, the vegetative population dies annually during the winter to give new growth during the spring. The tubers are the eaten part of JA which formed at the end of the stems. They are rich in Inulin, which is used in the industry to obtain fructose and it is useful for people suffering from diabetes [1]. The JA is an erect, rhizomatous perennial herb, up to 3-4 m height. Though perennial, it is mainly grown as an annual. It is a highly variable plant: many characteristics, including size (2 to 4 m), tuber colour (green or violet), stem number and the number of branches per stem depend on genetics and environmental conditions. The stems are generally hairy and branch in their lower part. The root system is fibrous and develops cord-like rhizomes that can reach more than 1 m in length. The apical part of the rhizome is swollen and forms a fleshy tuber. The leaves are opposite or alternate, ovate to lanceolate, toothed, pubescent on the lower surface and 3-20 cm long x 5-8 cm broad. The inflorescence is a pseudanthium borne alone or in groups at the end of the stem or on terminal axillary branches. The flower head is 5-11 cm in diameter (much smaller than that of the sunflower) and bears many small yellow tubular fertile flowers surrounded by yellow ray sterile flowers, the ligules of which are thought of as petals. The fruit is a hairy containing a mottled black or brown seed, 5 Mm length x 2 Mm width [2]. Phytobiotics is Plant products have been used for centuries by humans as food and to treat ailments. Natural medicinal products originating from herbs and spices have also been used as feed additives for farm animals in ancient cultures for the same length of time. To differentiate from the plant products used for veterinary purposes (prophylaxis and therapy of diagnosed health problems), phytobiotics were redefined by as plant-derived products added to the feed to improve performance of agricultural livestock [3]. Compared with synthetic antibiotics or inorganic chemicals, these plant-derived products have proven to be a natural, less toxic, residue free, and are thought to be ideal feed additives in food animal production [4]. With respect to biological origin, formulation, chemical description and purity, phytobiotics comprise a very wide range of substances and four subgroups may be classified: 1) herbs (product from flowering, non-woody and non-persistent plants), 2) botanicals (entire or processed parts of a plant, e.g., root, leaves, bark), 3) essential oils (hydro distilled extracts of volatile plant compounds), and 4) oleoresins (extracts based on non-aqueous solvents) [3]. Defined a prebiotic as a non-digestible food ingredient which beneficially affects the host by selectively stimulating the growth of and/or activating the metabolism of one or a limited number of health-promoting bacteria in the intestinal tract, thus improving the host's microbial balance [5]. The growth of endogenous microbial population groups such as bifidobacteria and lactobacilli is specifically stimulated and these bacteria species are perceived as beneficial to animal health. The dominant prebiotics are fructo-oligosaccharide products (FOS, oligofructose, inulin); gluco-oligosaccharides, stachyose, malto-oligosaccharides, and oligochitosan have also been investigated in broiler chickens [6-8]. Inulin belongs to a class of fructose-based, highly soluble polysaccharides collectively called fructans. Fructans are the major non-structural carbohydrates in many plant species, particularly in the prevalent and evolutionarily advanced orders of Asterales, Liliales and Poales e.g. chicory, onions, wheat [9]. Fructans are deposited in vacuoles and play an important role as carbohydrate reserves in addition to or as an alternative to starch e.g. in cereals [10], for reviews see [11]. They are also involved in osmoregulation e.g. in flowers and are believed to function as protectants against drought and cold stress [12]. Great interest is currently focused on fructans because of their potential value in food technology [13]. Using JA in the poultry farms was practiced first time by when he added it

to the layer hens diet as a phytobiotic and symbiotic, but no effect has been indicated in the egg production. While, supplementing 200 mg/kg, 250 mg/kg and 300 mg/kg of JA Inulin to the layer diet cased significant effect on the microbial count in cecum, egg production and quality [14,15]. Furthermore, reported that using 50, 100 ppm of JA powder in the daily layer diet have no effects on feed consumption, body weight, egg production, egg weight and egg mass traits [16]. Whereas, they have significant effects ($p<0.05$) on albumin percentage, the percentage of albumin to egg yolk, albumin height in the egg and Lactic acid bacteria count in cecum. In the same regard, supplementing 5% of JA powder in the broiler diet increased the Lactic acid and Enterobacteriaceae in the ilium [17]. This review gives an evidence that the *Helianthus tuberosus* L. could be good supplementation for poultry diet for many reasons. First, because it has prolific and cheap production. Second, it provides a high percentage of inulin. It is worthy to mention that the extracted inulin from *Helianthus tuberosus* L. will consider as prebiotic. While if the inulin used without extraction, means supplementing the *Jerusalem artichoke* completely to the poultry diet, it will consider as a phytobiotic. It can be suggested that the inulin will increase the numbers of the useful bacteria in the GIT. Therefore, the concentration of the bacteria secondary production, enzymes, will increase. That will increase the probability of diet metabolism, which will motivate the development of histoanatomical structures of the intestine. Lastly, using *Jerusalem artichoke* will improve the poultry feed conversion ratio which will reflect positively of the other production parameters. These observations, as a whole, result that *Helianthus tuberosus* L. is an economical and useful supplementation can be widely used in poultry farms.

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