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Nutritional Value of Citrus Pomace

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Abstract

Citrus residue resources are rich, because citrus residue is more abandoned, resulting in a great waste of resources, therefore, can increase the development of citrus residue, that is, reduce the waste of resources, protect the environment, will also improve economic benefits, promote the sustainable development of citrus industry.

Keywords

Citrus pomace; Nutrient; Functional component.

1. INTRODUCTION

Citrus is the most consumed fruit in the world, and with the continuous development of citrus processing industry, more and more citrus residue is produced. Citrus residue contains a lot of water, easy to rot, placed for a long time will produce odor, soil and water will also cause a certain pollution. Citrus residue mainly refers to the solid product formed by the remaining citrus peel, seeds, orange and residual pulp after processing. Citrus residue is rich in resources, but it is a great waste of resources due to the waste of citrus residue.

2. NUTRIENTS FROM CITRUS POMACE

There have been many reports about the main nutrients of citrus residue at home and abroad. Due to the different conditions such as climate, origin, harvest season, citrus varieties and processing technology, the research results vary greatly. According to different research reports at home and abroad[1-4], the nutritional components of citrus residue are summarized as follows (Table 1, Table 3, Table 3). The content of water in citrus residue is high, the nitrogen free extract is 64.31%~69.32, the crude protein is 6.40%~8.00%, the crude fat is 2.20%~4.43%, and the crude fiber is 10.10%~14.90%.The crude ash content is 3.71%~4.10%, calcium 0.65%~1.03%, phosphorus 0.10%~0.27%, the mineral and amino acid content of citrus residue is also rich[5, 6], in addition, citrus residue also contains a certain amount of vitamins and so on[7].

Table 1. Contents of conventional nutrients in citrus pomace (%)

DM	NFE	CP	EE	CF	Ash	Ca	P
93.00	69.32	6.66	4.43	12.68	3.71	/	/
90.06	64.84	6.62	2.20	12.50	3.90	1.03	0.10
90.30	67.30	6.40	2.40	10.10	4.10	0.65	0.27
93.51	64.31	8.00	2.35	14.90	3.92	0.83	0.13

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Table 2. Mineral content of citrus pomace (mg/kg)

Z	Fe	Cu	Mn	Mg	K	Se	I
16.00	108.40	4.80	13.20	804	3620	0.052	/
1.62	49.70	3.72	8.75	/	/	/	0.07
8.96	65.57	2.43	8.67	/	/	0.021	/

Table 3. Citrus pomace amino acid content (%)

AA	/	/	/	/
Lys	0.48	0.35	0.14	0.22
Met	/	0.08	0.03	0.02
Cys	/	0.05	0.06	0.02
Thr	0.29	0.25	0.16	0.20
Trp	/	/	0.02	0.05
Leu	0.18	0.36	0.32	0.33
Ile	0.14	0.23	0.19	0.18
Val	0.21	0.32	0.24	0.24
Phe	0.21	0.26	0.20	0.22
Tyr	0.43	0.22	/	0.15
His	0.34	0.13	0.10	0.10
Arg	0.23	0.31	0.23	0.19
Gly	0.69	0.29	0.24	0.25
Ser	0.37	0.30	0.16	0.21
Ala	0.26	0.41	0.22	0.28
Pro	0.64	0.98	0.33	0.51
Glu	0.94	0.53	0.59	0.54
Asp	0.44	0.51	0.56	0.46

3. FUNCTIONAL COMPONENTS OF CITRUS RESIDUE

Citrus residue contains a variety of effective ingredients, including pectin, essential oil, pigment and dietary fiber.

Pectin is a natural plant polysaccharide, and citrus residue is a common raw material for extracting pectin. Pectin is widely used in food industry, mainly as thickener, gelling agent, emulsifier and stabilizer[8]. The addition of pectin to yogurt products as a stabilizer, the addition of pectin to jam can play a thickening role, the addition of pectin to drinks can produce gelling reaction, enhance the taste of juice, is a safe and harmless food additive[9]. At the same time, pectin also has medicinal effects. Li Zhiping et al.[10] studied the effect of pectin doxorubicin macromolecular prodrug nanodelivery system (PDC-M) on SMMC7721 liver cancer cells, and the results showed that PDC-M could significantly inhibit the proliferation of SMMC7721 liver cancer cells and reduce their migration and invasion ability. Li Dafeng et al. [11]studied the antibacterial activity of pomelo peel pectin hydrolysate, and the results showed that pomelo peel pectin had obvious inhibitory effect on Escherichia coli, Bacillus subtilis and Staphylococcus aureus. Pectin can bind to cholesterol in the intestine, inhibit the absorption of cholesterol, and also has the function of lowering blood sugar[12].

The main component of essential oil is D-limonene[13], which is extracted by distillation, cold grinding, cold pressing and extraction. Orange peel essential oil is a natural fragrance that freshens the air and refreshes the mind. Liu Hua et al. [14] studied the antioxidant activity of orange peel essential oil, and the results showed that orange peel essential oil had a good scavenging ability for DPPH· free radicals, the clearance rate could reach 74.19%, but the

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storage time of the essential oil should not be too long, which would affect its antioxidant capacity. Orange peel essential oil is a safe and effective insecticide. Liu Pinhua et al. [15] found that the mixture of orange peel essential oil with amyl alcohol and n-amyl formate at a certain ratio can kill the butterfly, and the mixture of orange peel essential oil, amyl alcohol and n-amyl formate at a ratio of 0.3:0.3:3 has the best effect.

Orange peel pigment, as an important natural pigment, is widely used in the food industry and the pharmaceutical industry. It can be used as A colorant with high stability and as a nutrition enhancer. The carotenoid content in orange peel pigment is rich, and the carotenoid can be converted into vitamin A in the animal body, which can improve the body's immunity and antioxidant ability and has the effect of delaying aging[16, 17]. Li Lingxu et al.[18] studied the antibacterial activity of orange peel pigments and extracted water-soluble pigments, alcohol-soluble pigments, ether-soluble pigments and alcohol-soluble pigments from orange peel. The results showed that the extracts of different solvents in orange peel pigments had different degrees of inhibitory effects on pathogenic fungi, and the ether-soluble pigments and alcohol-soluble pigments had better antibacterial effects because flavonoids were the main components.It is speculated that flavonoids may be the main active ingredient of bacteriostasis.

The content of dietary fiber in citrus residue is higher, including insoluble dietary fiber and soluble dietary fiber. Dietary fiber can be used as an additive to food, nutrition and health.Wuttipalakom et al. [19] found that dietary fiber nutrition in lemon residue was balanced, the ratio of insoluble dietary fiber to soluble dietary fiber was 1:3, and the content of soluble dietary fiber was higher than that in bran. Dietary fiber is not directly digested by the body, but it has a unique role. The main function of dietary fiber is to promote intestinal health, improve the intestinal environment, and reduce the probability of heart disease. Li Ji et al. [20] studied the effect of citrus peel dietary fiber on lowering blood lipids in rats, and the results showed that citrus peel dietary fiber could effectively reduce blood lipids in rats fed high-fat diets and alleviate the abnormal lipid metabolism in rats.

4. CONCLUSION

Therefore, we can increase the development of citrus residue, that is, reduce the waste of resources, protect the environment, will also improve economic benefits, and promote the sustainable development of citrus industry.

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