

Preparation of a Kind of Bee pollen Effervescent Tablets

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Abstract. [Objective]The aim of the research is to develop a kind of bee pollen effervescent tablets. [Method] With bee pollen power and pregelatinized starch as main raw materials, the matching accessories are chosen by the orthogonal test to select the production technology of the bee pollen effervescent tablets. [Result] The optimized formula of the bee pollen effervescent tablets is bee pollen power 45%, pregelatinized starch 29.3%, citric acid 12.2%, sodium bicarbonate 9%, sodium cyclamate 2.0%, Xylitol7.0%, Xanthan gum0.5%, PEG6000 2.0%. [Conclusion] The bee pollen effervescent tablets prepared by this method which is simple and feasible, have stable quality and good taste, meet pharmacopeia standards, disintegrate rapidly and are easy to take.

Introduction

Since ancient times, bee pollen is considered as a kind of very good food and drug and there are a lot of records in the ancient literature. Bee pollen is composed of fructose and glucose and other sugars, easily absorbed by the body. In addition to containing sugar, bee pollen also contains a variety of nutrients beneficial in normal function of cells and tissues, and organs. Bee pollen has rich nutrition and great heat, with per kg mature heat yield about 12560 joules. Bee pollen has no fat, is perfect health tonic and is very suitable for the elderly, children, maternity and the sickness^[1].

As a new dosage form in recent years, effervescent tablets are convenient to carry, distribute quickly in the water, with effective components easy to absorption and high bioavailability advantages. Effervescent tablets have the characteristics of both the solid preparation and the liquid preparation, have broad market prospects in pharmaceuticals and food industry. First of all, in addition to the main agents and excipients in the production of effervescent tablets, you can also add flavorings, sweeteners, coloring agents and excipients, etc, to improve the food flavor and develop a series of different flavors of effervescent food. Secondly, the effervescent has special disintegrants—effervescent disintegrants, disintegrate rapidly in cold water, help absorption and easier to take and carry than other formulations. The effervescent tablets form the food with delicious flavor and taste, instant ready to drink, especially to cater to the young people who love the new, extraordinary and special, has obvious advantages in the field of children and adolescents^[2]. The bee pollen effervescent tablets using bee pollen as raw material made by this paper retain the nutrients and flavor of bee pollen, rapid disintegration, good taste, convenient use and convenient carrying, long shelf life, become hot and cold can of carbonated beverage after dissolving, greatly increase the drinking interest.

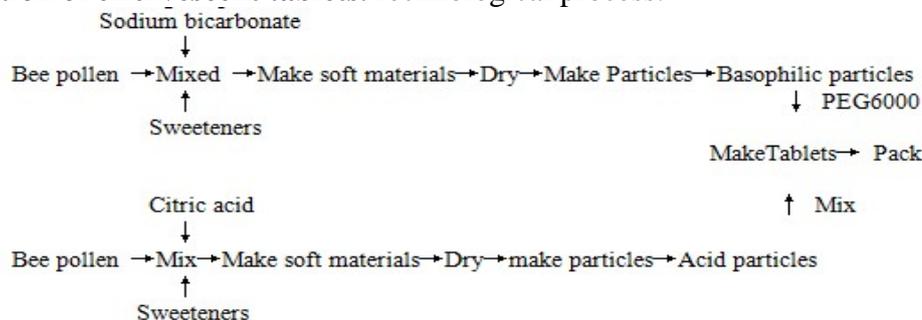
Materials and Methods

Materials. Bee pollen power (Wuhan LittleBee Food Co., Ltd.), sodium cyclamate (Guangdong huasheng food chemical company in guangzhou branch), sodium bicarbonate (Beijing the odd century chemical trading company), citric acid (Hubei and galactic chemical manufacturing company), pregelatinized starch (Tianjin peak starch development company), etc, are consumption level; absolute ethyl alcohol is of analytical grade, PEG6000 (Suzhou beautiful alum chemical industry trade company) is for medicinal level.

Instruments. TDP model sheet stamping machine (Shanghai tensho health station pharmaceutical machinery company), FA2104N analytical balance (Beijing ze xiang yongxing technology

company), GZX-9070 mbe digital display blast drying oven (GZX-9070 mbe digital display blast drying oven), 78X-Ztype tablet four eyes with meter (Shanghai yellow sea drug test instrument factory), YK-60 type granulator (Hunan ensure pharmaceutical machinery factory), WF130-30 universal mill (Changzhou music star drying equipment company).

Preparation of effervescent tablets. Technological process.



The operation points. Take bee pollen power, sodium bicarbonate, pregelatinized starch, sodium cyclamate and mix. Mixed with anhydrous ethanol spray, make the mixture can be molded into clusters, and can spread out, 20 mesh sieve, make soft material. In 50°C drying box for drying, so that water is below 3%. 20 mesh to pelletize. Take bee pollen power, citric acid, pregelatinized starch, sodium cyclamate and mix. Mixed with anhydrous ethanol spray, make the mixture can be molded into clusters, and can spread out, 20 mesh sieve, make soft material. In 50°C drying box for drying, so that water is below 3%. 20 mesh to pelletize. Weigh the alkali, acid, PEG6000 and mix. Tablet in the tableting machine^[3].

The formula design. The main factors affecting the effervescent tablets include sweetness, flavor, acidity of bee pollen powder content, sweetener content etc. In order to meet consumer tastes, the content of sugar and acid in the effervescent tablets should be deployed. Sensory evaluation contains the color, smell, taste, shape, according to the results, determine the optimal formula^[4].

Determination of the quality indicators. Weight determination^[5], according to inspection in accordance with the Chinese Pharmacopoeia 2010 edition an appendix I tablet weight difference. The disintegration test^[5], check according to the Chinese Pharmacopoeia 2005 version of under disintegration effervescent tablets according to law. The measurement of pH^[5], take 3 samples, plus 50°C 100mL water to dissolve, after 1 minutes, measure pH value according to the determination method of Chinese Pharmacopoeia 2010 version of an appendix VII. The amount of CO₂ in the effervescent^[6], weigh the conical flask and 100mL water and 10 pieces of sample using weight precision loss method, record the total. The sample is added to the water, shaking with 20mins again precisely weigh the conical flask until no bubbles emerge, record weight, the reducing weight is the amount of CO₂.

Sensory evaluation method. Using sensory evaluation method, use respectively by color, smell, taste, posture as the target of sensory evaluation^[7].

Table IBEE POLLENEFFERVESCENT BEVERAGES SCORING REFERENCE STANDARD

Color (20score)	Smell (30score)	Taste (30score)	Posture (20score)
Ivory without impurities (18-20)	Bee pollen unique fragrance, rich (20-30)	Has the unique taste of bee pollen (27-30)	Clear, without impurities, no separation (18-20)
pale Ivory without impurities (16-18)	Have fragrance, rich (24-27)	Has the unique taste of bee pollen, suitable sweet and sour (24-27)	Without impurities, no separation (16-18)
Pale yellow, slightly impurity (below 16)	Have fragrance, light (below 24)	Bee pollen taste is light, not palatable (below 24)	Light turbidity, impurity (below 16)

Results and Discussions

A. Single factor experiment done to achieve primary influencing factors of the preparation process .

The determination of adhesive. Using absolute ethyl alcohol as adhesive, particle is not easy to agglomerate and dry quickly, products dissolve rapidly. Therefore, using absolute ethyl alcohol as adhesive, its effect is induced by the viscous and wetting tablet.

The determination of lubricant. Particles must be added lubricants before tableting with the purpose of avoiding weight variation, the sticking difficulties during the industrialized production of tablet, and maintaining tablets's smooth appearance which is convenient to tablet smoothly^[8]. Reference^[9] shows that the lubricant PEG6000 has good lubricity, viscous resistance and watersolubility. So we choose PEG6000 as the lubricant, the single factor experiment was conducted to determine the amount of polyethylene glycol 2%.

The determination of sweeteners. In order to improve the taste of bee pollen effervescent tablets, we should choose the appropriate sweetener to eliminate pungent taste sour and to reach the appropriate sweet-sour ratio^[10]. In the choice of the sweetener cyclamate, sodium cyclamate is a kind of common sweeteners, the sweetness is 50 times of sucrose. Sodium cyclamate belongs to the non-nutritive sweeteners, is generally not involved in glucose metabolism, but also can not be biodegraded, is suitable for patients with diabetes and obesity. It does not produce dental caries, its sweetener tastes better than the general sweeteners, and the single factor experiment was conducted to determine the adding amount is 2.5%.

The determination of effervescent agent. Effervescent disintegrating agent is a kind of acid-base system that will produce carbon dioxide gas disintegration when mixed with water. Since citric acid taste mellow, soft, refreshing, delicious, we use citric acid as acid source. All things taken into consideration, choose citric acid and sodium bicarbonate as effervescent disintegrating agent^[10]. In practical applications, the acid dosage should be larger than the amount of chemical reaction theory to ensure carbonate reaction completely and weak acid of the effervescent tablets, so as to change the effervescent tablets taste sense^[10]. Using single factor test, the pH value and taste for evaluation, results show that, when the citric acid and sodium bicarbonate mass ratio was 1.4:1, the pH value is 4.5, the taste is best.

Orthogonal test to optimize the preparation process. According to the results of single factor test, screen factor A (effervescent disintegrating agent), B (bee pollen powder dosage), C (PEG6000 content), D (sodium cyclamate content) and carry out orthogonal test, anhydrous ethanol added according to requirements, filler pregelatinized starch to maintain weight^[11], evaluate the quality according to the sensory index score of finished products.

Table II TEST FACTORS LEVEL TABLE

Levels	Factors			
	A/%	B/%	C/%	D/%
1	15	40	1.5	2.0
2	20	45	2.0	2.5
3	25	50	2.5	3.0

Table III ORTHOGONAL TEST RESULTS AND ANALYSIS

Number	A Effervescent disintegrating agent /%	B Bee pollen /%	C PEG6000/%	D Sodium cyclamate /%	Sensory scores %
1	1	1	1	1	75
2	1	2	2	2	77
3	1	3	3	3	74
4	2	1	2	3	77
5	2	2	3	1	80
6	2	3	1	2	78
7	3	1	3	2	70
8	3	2	1	3	76
9	3	3	2	1	74
K ₁	226	222	229	229	
K ₂	235	233	228	225	
K ₃	220	226	224	227	
k ₁	75.33	74.00	76.33	76.33	
k ₂	78.33	77.67	76.00	75.00	
k ₃	73.33	75.33	74.67	74.67	
R	5.00	3.67	1.67	1.37	

The optimal combination for flavor $A_2B_2C_3D_1$, Factor D (The amount of sodium cyclamate) as the least significant factors, and has little influence on the flavor. Therefore, according to the principle of saving raw material, we choose $A_2B_2C_3D_1$ as the optimal formula. Through calculation, the best formula of bee pollen effervescent tablets is: bee pollen 45%, pregelatinized starch 22.3%, citric acid 12.2%, Sodium bicarbonate 9%, xylitol 7%, Sodium cyclamate 2.0%, PEG 2.0%, Xanthan gum 0.5%. The preparation process is simple and feasible, Melissa effervescent tablets prepared by the stable quality, meet the requirements of Pharmacopoeia, rapid disintegration, taste with bee pollen specific aroma.

B. Verification test.

Select three batches preferably by orthogonal test results, the tablet disintegration time were 120, 130, 140s. The effervescent tablet has sweet and sour taste, refreshing and aromatic taste, blister fast, has smooth appearance, uniform color and bee pollen flavor. The experiment results show that this technological process is stable and feasible.

C. The quality of finished products.

Product color is yellow; morphology is round, the surface is smooth and appearance is neat; the aroma and taste has a little bee pollen aroma, sweet and sour, soft taste; moderate hardness.

Summary

Through calculation, the best formula of bee pollen effervescent tablets is: bee pollen 45%, pregelatinized starch 22.3%, citric acid 12.2%, sodium bicarbonate 9%, xylitol 7%, sodium cyclamate 2.0%, PEG 2.0%, Xanthan gum 0.5%. The preparation process is simple and feasible, Melissa effervescent tablets prepared by the stable quality, meet the requirements of Pharmacopoeia, rapid disintegration, taste with bee pollen specific aroma.

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