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Gastrointestinal Motility and Postprandial Comfort with a Multi-Botanical Instant Granule: Experimental Evaluation and Human Product-Consumption Findings

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Citation: Igoundaz, Y., Han Y., Chraibi A. Gastrointestinal Motility and Postprandial Comfort with a Multi-Botanical Instant Granule: Experimental Evaluation and Human Product-Consumption Findings. American Journal of Biomedicine and Pharmacy 2026, 3(9), 180-184.

Received: 10th Jan 2026

Revised: 17th Feb 2026

Accepted: 20th Mar 2026

Published: 20th Sept 2026



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Abstract: A staged NVTIA® botanical granule containing Poria cocos, coix seed, dandelion leaf, corn silk, citrus peel, cranberry, and fennel seed was examined for gastrointestinal motility and postprandial comfort. In the dampness-heavy-state mouse model, gastric emptying and small-intestinal propulsion were 42.1% and 45.7% in the model group and 56.8% and 61.3% after formulation 1; normal-group values were 63.5% and 68.4%. Adults with at least three prespecified bodily sensations consumed 4.0 g once daily for 14 days, 20 participants per group. With formulation 1, postprandial bloating changed from 6.4 to 3.1 and the five-domain total from 31.8 to 15.6, a 51.0% reduction. Direct mixing and selected ingredient-omission comparators produced smaller changes. Human studies of fennel-containing interventions and coix seed provide ingredient-level digestive context, while experimental and human work on Poria cocos, cranberry, and citrus helps define plausible intestinal and microbiome pathways. The results identify gastric emptying, intestinal propulsion, postprandial bloating, and bowel sensations as separate endpoints for subsequent controlled evaluation of the complete formulation.

Keywords: Poria cocos; Coix lacryma-jobi; fennel; citrus peel; gastrointestinal motility; postprandial bloating; botanical granule.

1. INTRODUCTION

Postprandial fullness and bloating can arise from more than one gastrointestinal process. Gastric emptying, intestinal transit, luminal fermentation, visceral sensitivity, and food-matrix effects may contribute in different proportions. A multi-botanical product can therefore be tested more clearly when transit-related measurements and consumer sensations are kept separate. The formulation studied here combines extracted botanicals with roasted or micronized food materials and a staged granulation process intended to improve dispersion without exposing every component to the same processing conditions.

Several ingredients already have relevant external evidence. In 121 adults with irritable bowel syndrome, Portincasa et al. reported a larger symptom-score reduction with a curcumin-fennel essential-oil combination than with placebo [1]. Wu et al. observed relief of digestive symptoms during a 12-week coix-seed dietary pilot in peritoneal-dialysis patients [2]. Short-term coix-seed intake has also been associated with changes in gut microbial profiles [3]. Hwang et al. reported a 5-HT₄-linked effect of hesperidin on pacemaker potentials in murine interstitial cells of Cajal [4], and Poria cocos polysaccharide has been examined in experimental intestinal-barrier research [5]. These studies differ in population and preparation, so they are used here to identify pathways and endpoints rather than to predict an effect size for the complete granule.

2. MATERIALS AND METHODS

2.1 Botanical composition and staged processing

The primary formulation contained the plant materials shown in Table 1 together with resistant dextrin, maltodextrin, gum arabic, hydroxypropyl methylcellulose, and silicon dioxide. Poria cocos, dandelion leaf, and corn silk were water-extracted and spray-dried. Coix seed was roasted at low temperature and micronized. Citrus peel and fennel seed were micronized separately. The components were fluidized-bed granulated, and cranberry powder was added only after the material temperature had fallen below 40°C. At least 80% of particles in the primary formulation were in the 20-60 mesh range.

Table 1. Principal plant-material charge of the primary tested formulation.

Plant material	Charge per 1000 g batch
Poria cocos	170 g
Coix seed	160 g
Dandelion leaf	95 g
Corn silk	95 g
Citrus peel	70 g
Cranberry fruit powder	60 g
Fennel seed	30 g

2.2 Gastrointestinal-motility evaluation

SPF-grade male ICR mice were assigned at 10 animals per group. Except for the normal group, animals underwent 14 days of high-fat feed, damp bedding, and low-temperature drinking water. Sample groups then received the assigned formulation by gavage at 0.8 g/kg body weight/day for 7 days; normal and model groups received purified water. Gastric emptying, small-intestinal propulsion, fecal moisture, 6-h urine volume, and the composite bodily-state score were recorded at the end of the intervention.

2.3 Fourteen-day product-consumption bodily-sensation evaluation

Adults reporting at least three of five prespecified sensations - body heaviness, postprandial abdominal bloating, sticky-mouth sensation, loose-stool sensation, and drowsiness - were enrolled at 20 participants per group. The corresponding sample was consumed once daily at 4.0 g for 14 consecutive days. Each sensation was rated on a 10-point self-report scale before and after the observation period.

2.4 External evidence synthesis

External evidence was selected for fennel, coix seed, citrus, cranberry, and Poria cocos when the study addressed gastrointestinal symptoms, motility-related biology, intestinal barrier function, or the gut microbiome. Human intervention studies were prioritized where available. Cell and animal

studies were kept as mechanistic context and were not used as substitutes for clinical outcomes.

3. RESULT

3.1 Gastrointestinal motility

Gastric emptying was 63.5% in normal animals and 42.1% in the model group; small-intestinal propulsion was 68.4% and 45.7%, respectively. Formulation 1 produced 56.8% gastric emptying and 61.3% intestinal propulsion. Formulations 2 and 3 produced 55.6%/59.8% and 57.2%/62.1%. The direct-mix comparator produced 48.3%/51.6%, and the citrus-peel/fennel-free comparator 54.4%/57.6%.

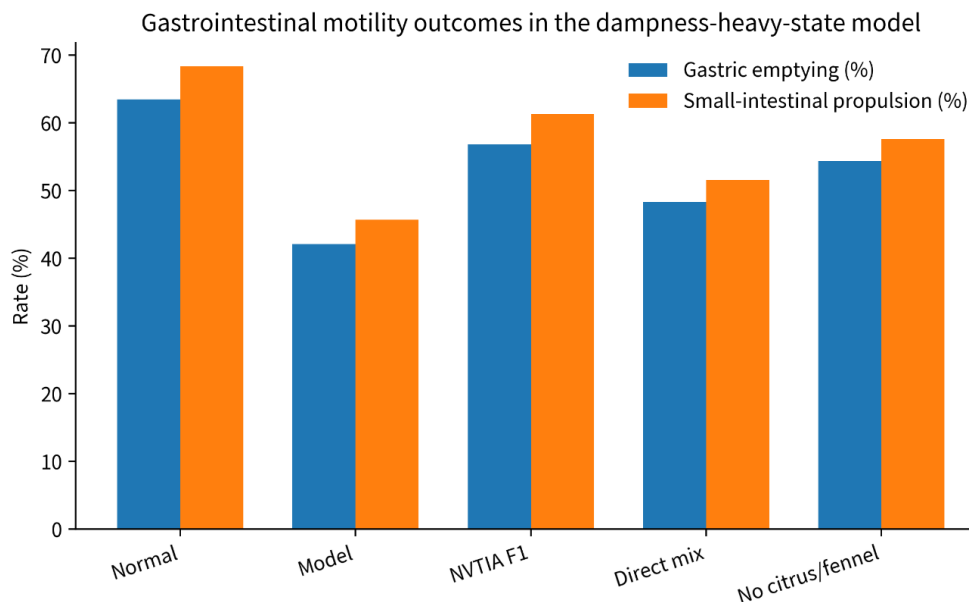


Figure 1. Gastric emptying and small-intestinal propulsion in selected experimental groups. Values are the reported group outcomes; no unreported error terms or significance estimates are added.

Table 2. Selected gastrointestinal outcomes in the animal evaluation.

Group	Gastric emptying (%)	Small-intestinal propulsion (%)	Dampness-heavy score
Normal	63.5	68.4	1.3
Model	42.1	45.7	7.2
NVTIA formulation 1	56.8	61.3	2.9
NVTIA formulation 2	55.6	59.8	3.2
NVTIA formulation 3	57.2	62.1	2.8
Direct-mix comparator	48.3	51.6	5.5
No citrus peel/fennel	54.4	57.6	4.4

3.2 Postprandial and composite bodily sensations

In the product-consumption observation, formulation 1 changed postprandial bloating from 6.4 to 3.1, body heaviness from 6.8 to 3.2, sticky-mouth sensation from 6.1 to 2.9, loose-stool sensation from 5.9 to 3.0, and drowsiness from 6.6 to 3.4. The five-domain total changed from 31.8 to 15.6, a 51.0% reduction. The direct-mix comparator changed from 31.2 to 26.0 (16.7%), and the comparator without *Poria cocos/coix* seed changed from 31.7 to 27.5 (13.3%).

4. DISCUSSION

Cadres The animal and product-consumption datasets meet at one practical point: transit-related measures changed in the model at the same time that postprandial bloating changed in the human observation. They should not be treated as equivalent outcomes, but the combination gives a clearer rationale for a controlled study than either dataset alone. The direct-mix comparator was weaker on both gastric emptying and intestinal propulsion, which also keeps formulation process in the research question rather than treating the botanical list as the only variable.

Fennel is the ingredient with the closest symptom-oriented human precedent. Portincasa et al. reported a 50.05% mean relative reduction in IBS symptom-severity score with a curcumin-fennel essential-oil intervention versus 26.12% with placebo [1]. The trial used a combination product in a

diagnosed IBS population, so the result is most useful for bloating and abdominal-symptom endpoint selection. Hesperidin-related motility biology adds a separate citrus mechanism [4].

Coix seed and *Poria cocos* broaden the intestinal context. The coix pilot reported digestive-symptom changes [2], and short-term intake altered gut microbial profiles in healthy men [3]. *Poria cocos* polysaccharide has been studied for intestinal barrier maintenance [5]. Other *Poria* experiments include an ethanol extract in a tumor-associated intestinal setting [6], a 2025 evaluation of *Poria* polysaccharides as a potential microbiota-directed prebiotic [7], and a DSS-colitis model in which *Poria cocos* was examined together with gut-microbiota changes [8]. These are mechanistic studies, but they give concrete variables - barrier function, microbial composition, and inflammatory signaling - for future formulation work.

Cranberry and citrus can be treated as matrix components with microbiome and metabolite effects rather than only as flavor or polyphenol markers. In a randomized crossover feeding trial, cranberries attenuated animal-based-diet-associated changes in gut microbial composition and function [9]. A separate cranberry-beverage trial in participants with *Helicobacter pylori* infection measured oxidative and microbiota outcomes [10], and a 2026 pilot in overweight or obese adults examined low-dose cranberry polyphenols, gut microbiota, and circulating metabolites [11]. Human orange-juice studies have likewise reported changes in gut microbial profiles [12], blood glucose/lipid and microbiota-metabolite measures [13], and urinary excretion of flavanone gut-derived metabolites after chronic intake [14]. A randomized trial in older adults with functional constipation tested a *Foeniculum vulgare*-*Rosa damascena* herbal formula and reported clinical bowel outcomes [15]. A complete-formulation trial can therefore measure bloating and transit first, then add stool microbiome or targeted metabolite endpoints if mechanistic depth is needed.

5. Current Scope and Future Directions

A randomized, placebo-controlled study of the complete 4.0 g/day granule could use a standardized meal challenge and prespecified postprandial-bloating scores as the main consumer endpoint. Gastric emptying or a validated transit measure can be added in a smaller mechanistic subgroup. Stool form, bowel frequency, rescue-medication use, and diet should be recorded prospectively. If microbiome sampling is included, baseline community structure and recent antibiotic or probiotic use should be defined before analysis.

5. CONCLUSIONS

In the animal model, formulation 1 increased gastric emptying from 42.1% to 56.8% and small-intestinal propulsion from 45.7% to 61.3%. During 14 days of product consumption, postprandial bloating changed from 6.4 to 3.1 and the five-domain total from 31.8 to 15.6. Fennel and coix studies provide human gastrointestinal context, while *Poria cocos*, cranberry, and citrus research supplies barrier, microbiome, and metabolite pathways. These results define a focused next study built around postprandial comfort and directly measured gastrointestinal function.

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