UDC 615.233:615.453.87:615.322:612.017.1

O. A. Manscy

National University of Pharmacy

JUSTIFICATION OF COMPOSITION AND TECHNOLOGY OF GRANULES WITH SUNFLOWER PROTEIN AND PLANT POLYEXTRACT

In this article selections on the dosage form and on development of the technology of immunomodulating and antitussive action preparation are made. As objects of research were chosen the natural compounds: polyextract of antitussive action and sunflower plant protein. As a rational pharmaceutical form we have selected granules. It has been found at the obtained granulate research in accordance with methods of SPhU, that on technological descriptions the granulate has all the necessary technological characteristics to ensure smooth operation of a dosing machine. During the execution of work a technology of granulate obtaining from sunflower protein and polyextract has been developed, a dosage form for anti-cough and immunomodulating action preparation has been selected, a technology of tea granules with sunflower plant protein and polyextract of antitussive action has been developed.

Key words: immunity; cough; extracts; vegetable protein; technological properties; granules

INTRODUCTION

In recent years, Ukraine is experiencing a rapid growth in the rate of respiratory diseases among the population, which is primarily associated with weakened immune systems. One of the major ways to maintain the normal functioning of the human immune system in conditions of immune stress is the use of immunomodulators.

However, considering that this group of diseases is accompanied by inflammation of the mucous membranes of the upper respiratory tract which is clinically manifested in swelling of goblet cells, painful stimulation and reflex emergence of dry cough as the treatment it is advisable to use drugs of antitussive action.

Thus, the problem of creating the medicinal product of combined action (immunomodulating and antitussive) is important for practical pharmacy.

Objective: dosage form selection and development of technology of immunomodulating and antitussive action drug.

MATERIALS AND METHODS

As material were selected the natural compounds polyextract of antitussive action [1] (polyextract developed and prepared at the NUPh under the supervision of Prof. Gladukh E. V.) and sunflower vegetable protein as a diluent that exhibits immunomodulatory properties [7] (vegetable sunflower protein was prepared at the Institute of biology, Kharkiv National Karazin University, under supervision of prof. Bozhkov A. I.).

When performing the experiment the following technological methods of granulate research according to SPU [2-5] were used: determination of granulometric composition (SPU 1.2, Section 9.2.38), the definition of parameters of fluidity and angle of repose (SPU 1.3, Section 9.2.36) bulk volume and bulk density (SPU 1.3, Section 2.9.34).

RESULTS AND DISCUSSION

As a rational dosage form (DF) granules were chosen, due to the relative simplicity of the technological process comparing to other solid DF; minimum number of excipients; as a result of the granules dissolution solution or suspension with a pleasant taste is formed, which is allowing use in pediatric practice [8].

Upon receipt of the granules used sunflower vegetable protein powder as a component of the immunostimulatory effect and polyextract as a moisturizer and a component of antitussive action.

The granulate was prepared by wet granulation. The ratio of polyextract and protein was 1.2:1, respectively. This proportion is due to the fact that at bigger amount of liquid ingredient the mass loses its structure and is beginning to spread.

Fig. 1 shows a photograph of obtained granules.

As seen in Fig. 1, the resulting granules are sufficiently uniform in geometric size granules have a rounded, symmetrical shape, which should provide subsequently necessary level of fluidity.

When dissolved in water granules forme suspension.

Results of these studies are presented in Tab. 1-3 and in Fig. 2.

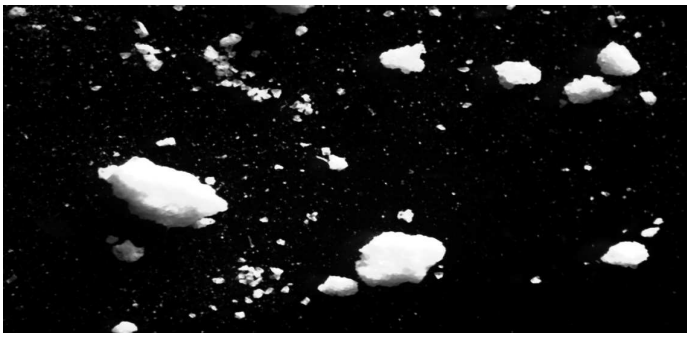


Fig. 1. *Photo of granules with polyextract.*

Determination of granulometric composition of granules

Results of determination of granulometric composition of granules are shown in Tab. 1.

As seen from the data presented in Tab. 1, about 77.47 % takes fraction with particle size of 100 microns.

For granules of size 90 microns or less observed unsatisfactory fluidity degree (> 17 s/100 g).

Therefore for further studies used 100 micron fraction of granules.

Determination of granules fluidity

Results of granules fluidity determination are shown in Tab. 2.

As seen from the data presented in Tab. 2, the granulate has sufficient fluidity – 3.47 s/100 g, which allowed to avoid additional excipients.

The angle of repose was 18, which also indirectly indicates an adequate level of granules fluidity.

Determination of the bulk volume of the granulate

Results of determination of bulk volume of a before and after tapping, ability to settling are given in Tab. 3.

As seen from the data presented in Tab. 3, granules show virtually no ability to settling (difference between V10 and V500 is 0,5 ml). At the further experiment bulk, volume amounted to 33 ml and remained unchanged.

As a result of calculating the bulk density value equals 0.833 g/ml; density value after tapping is 0.909 g/ml. Thus the granulate ensures stable operation of a dispensing machine.

Determination of residual moisture of the granules

The resulting granules were tested for residual humidity at hygrometer Sartorius MA 150 (Germany). The level of residual moisture was 19.13 %.

Table 1

RESULTS OF DETERMINATION OF GRANULOMETRIC COMPOSITION

Index	Particle size, μm				
	100 μm	90 μm	80 μm	71 μm	0,063 mm
Weight, g	21,950	2,210	1,275	0,860	1,100
%	77,47	7,80	4,50	3,03	3,80

Table 2

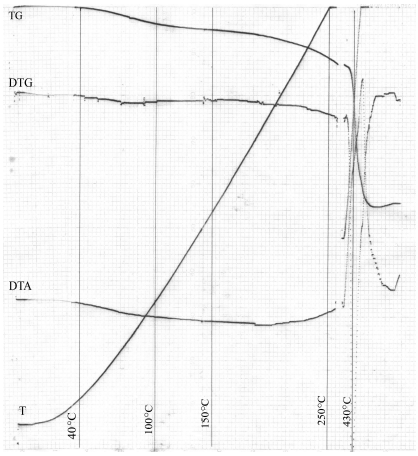
RESULTS OF FLUIDITY DETERMINATION

Weight of granules, g	Fluidity, sec/100 g			Average value
	1 test	2 test	3 test	
100,00	3,89	4,01	2,52	3,47

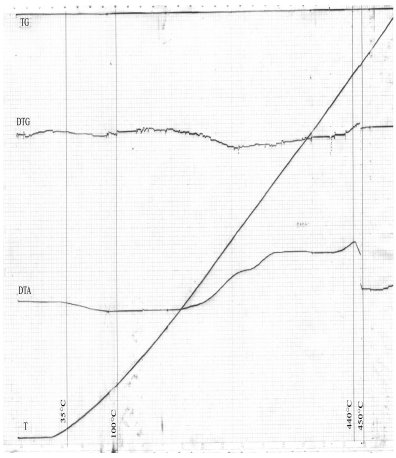
Table 3

RESULTS OF DETERMINATION OF BULK VOLUME

Sample substance	V_0, ml	V_{10}, ml	V_{500}, ml	V_{1250}, ml	V_{2500}, ml	Ability to settling
Granules	36	35,5	35	33	–	0,5



Sample 1



Sample 2

Fig. 2. *Derivatograms of samples 1 and 2 (comments in text).*

Choosing the granules final drying temperature mode

When selecting the mode of the granulate drying proceeded from the properties of sunflower protein polyextract and derivatographic research. Data of Fig. 2 shows derivatograms for granulate consisting of sunflower protein and polyextract (sample 1) and sunflower protein (sample 2), respectively. For polyextract making derivatogram was impractical because at temperatures above 100 °C it boils.

Based on data from Fig. 2, it can be noted that the sample 1 at a temperature of up to 40 °C is stable, no changes observed; when heated to 100 °C water evaporation occurs 4 %, sample is energetically stable; when heated to 250 °C mass loss is 12 %, the sample is stable; with increasing temperature to 400 and 430 °C there is an intensive decomposition and burning of the sample (polyextract burnout), respectively.

Sample 2 is stable with increasing temperature up to 430 °C, then there is its destruction.

The resulting granulate dried at 60 °C for 5 hours; after cooling measured the final moisture level, which was 0.3 %, which meets the requirements to ensure the smooth operation of a filling machine.

Thus, using this technology of granules there is no physical or chemical destruction of granules with sunflower protein and polyextract.

Determination of granules' hygroscopicity

With the purpose of rational choice of primary packaging it is necessary to know the level of the granules' hygroscopicity.

To determine this parameter, conducted an experiment: took 1 g of granules and placed them in a desiccator in which the humidity was 100 %.

Hygroscopicity was determined by the formula:

$$W_i = \frac{\frac{m_{\text{н}} \cdot 0.3}{100} + m_i - m_{\text{н}}}{m_i} \cdot 100\ \%,$$

where: W_i – humidity, %;
m_i – final weight, g;
$m_{\text{н}}$ – initial weight, g;
0,3 – initial moisture content, %.

As a result of calculation the final humidity level amounted 0.3%. Thus the granulate is not hygroscopic.

As the primary packaging for granules can be chosen multidose polymeric containers [8].

The therapeutic dose of sunflower protein is 0.14 grams per adult weighing 70 kg [6]. Then, given the bulk density appropriate volume of granules per dose is 0.17 ml, which is measured using a measuring spoon.

On the basis of the Scientific Research Institute of Biology of Kharkiv National Karazin University. under the supervision of prof. Bozhkov A. I. planned further pharmacological studies of sunflower protein and polyextract granules on animals.

CONCLUSIONS

1. Technology to produce granules with sunflower protein and vegetable polyextract by wet granulation has been developed.
2. Dosage form for the drug of antitussive and immunomodulatory action in the form of pellets has been chosen.
3. Obtained granules possess all the necessary technological characteristics to ensure smooth operation of a dosing machine.

REFERENCES

1. Бондаренко А. С. Дослідження технологічних параметрів лікарської рослинної сировини при створенні сиропу для лікування застудних захворювань / А. С. Бондаренко, Є. В. Гладух, О. М. Котенко // Вісник фармації. – 2011. – № 3 (67). – С. 17-19.
2. Державна фармакопея України [Текст] / Державне підприємство «Науково-експертний фармакопейний центр». – 1-е вид. – Х.: РІРЕГ, 2001. – 556 с.
3. Державна фармакопея України / Державне підприємство «Науково-експертний фармакопейний центр». – Доп. 1. – Х., 2004. – 520 с.
4. Державна фармакопея України / Державне підприємство «Науково-експертний фармакопейний центр». – Доп. 2. – Х., 2008. – 620 с.
5. Державна фармакопея України / Державне підприємство «Науково-експертний фармакопейний центр». – Доп. 3. – Х., 2009. – 280 с.
6. Звягинцева О. В. Характеристика неспецифических низкомолекулярных и специфических высокомолекулярных факторов резистентности последействием стрессовых нагрузок у животных разного возраста: дис. … канд. биол. наук: спец. 03.00.13. – Х., 2012. – 115 с.
7. ТУ У 10.8-24126303-001:2013 Добавка харчова білково-соняшникова «Ідеал».
8. Чуєшов В. І. Технологія ліків промислового виробництва: [підруч. для студ. вищ. навч. закл.]. – В 2-х ч. / [В. І. Чуєшов, Є. В. Гладух, І. В. Сайко та ін.]. – 2-е вид., перероб. і доп. – Х.: НФаУ; Оригінал, 2012. – Ч. 1. – 694 с.

УДК 615.233:615.453.87:615.322:612.017.1

А. А. Манский

ОБОСНОВАНИЕ СОСТАВА И ТЕХНОЛОГИИ ГРАНУЛ С БЕЛКОМ ПОДСОЛНЕЧНИКА И РАСТИТЕЛЬНЫМ ПОЛИЭКСТРАКТОМ

В данной работе обоснован выбор лекарственной формы и разработана технология препарата иммуномодулирующего и противокашлевого действия. В качестве объектов исследования выступали природные соединения: полиэкстракт противокашлевого действия и растительный белок подсолнуха. Как рациональная лекарственная форма были выбраны гранулы. Установлено, что гранулят обладает необходимыми технологическими характеристиками для обеспечения бесперебойной работы дозирующего автомата.

Ключевые слова: иммунитет; кашель; экстракты; растительный протеин; особенности технологии; гранулы

УДК 615.233:615.453.87:615.322:612.017.1

О. А. Манський

ОБГРУНТУВАННЯ СКЛАДУ ТА ТЕХНОЛОГІЇ ГРАНУЛ З БІЛКОМ СОНЯШНИКА ТА РОСЛИННИМ ПОЛІЕКСТРАКТОМ

В даній роботі обгрунтовано вибір лікарської форми та розроблена технологія препарату імуностимулюючої та протикашлевої дії. В якості об'єктів дослідження вибрані природні сполуки: поліекстракт протикашлевої дії і рослинний білок соняшника. Як раціональна лікарська форма були обрані гранули. Встановлено, що отриманий гранулят володіє необхідними технологічними характеристиками для забезпечення безперебійної роботи дозуючого автомата.

Ключові слова: імунітет; кашель; екстракти; рослинний протеїн; особливості технології; гранули

Адреса для листування:
61168, м. Харків, вул. Блюхера, 4.
Тел. (0572) 67 91 51. E-mail: manscy@yandex.ru.
Національний фармацевтичний університет

Надійшла до редакції 14.04.2014 р.