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INVESTIGATION OF THE PHARMACEUTICAL FACTORS INFLUENCE ON TECHNOLOGICAL PROPERTIES OF THE COMPRESSION MIXTURE AND SOME QUALITY INDICATORS OF TABLETS BASED ON MALVA SYLVESTRIS L. AND PLANTAGO LANCEOLATA L. DRY EXTRACTS

© S. Ya. Beley¹, T. A. Hroshovyi², N. M. Beley²

LLC «Ternofarm»¹, Ternopil

I. Horbachevsky Ternopil State Medical University²

beley@tdmu.edu.ua

The aim of the work. Studying the excipients influence on the process of wetting and granulation, mass loss, flowability and bulk density of the compression mixture, the compressing process and the tablets appearance in order to develop combined tablets based on *Malva sylvestris* flowers and *Plantago lanceolata* L. leaves dry extracts by method of wet granulation.

Materials and Methods. The main active substances are dry extracts of *Malva sylvestris* flowers and *Plantago lanceolata* leaves, 16 excipients – pharmaceutical factors. The tablets were obtained by the method of wet granulation. Investigation of the influence of excipients on the flowability and bulk density of compression mixture were carried out in accordance with the requirements of the State Pharmacopoeia.

Results and Discussion. In order to develop the composition and technology of tablets based on *Malva sylvestris* L. and *Plantago lanceolata* L. dry extracts we had to select the optimal excipients: fillers, binders, disintegrants, moisture regulators. To study the influence of four factors and their levels on the technological properties of the compression mixture and the appearance of the tablets based on *Malva sylvestris* L. and *Plantago lanceolata* L. dry extracts, 4x4 Greek-Latin square was used. Thus, the technological properties were the best when such excipient were used: MCC 101 and MCC 102; plasdon K-25alcohol solution, polyplasdon XL-10, silicon dioxide colloidal anhydrous, neuselin UFL-2, saccharose, and lactose monohydrate.

Conclusions. The influence of 4 qualitative factors on the compression mixture technological properties, the compressing process and appearance of the tablets based on the *Malva sylvestris* L. and *Plantago lanceolata* L. dry extracts were studied with using the mathematical planning of the experiment (4x4 Greek-Latin square). The excipients which showed the best results of the studied parameters were selected for the further study at the development of the optimal composition and technology of tablets based on *Malva sylvestris* L. and *Plantago lanceolata* L. dry extracts.

Key words: pharmaceutical factors; technological properties; compression mixture; tablets; extracts of *Malva sylvestris* L. and *Plantago lanceolata* L.

Introduction. Today, medicines contained biologically active substances of plant origin are very popular in Ukraine. People are more confident in natural medicines because they are characterized by fewer side effects and high efficacy.

Plantago lanceolata L. has been used for treatment of the respiratory system inflammatory diseases: respiratory tract, bronchitis, tuberculosis, and pertussis [2]. This area of application is determined by a wide spectrum of pharmacological activity of this plant: wound-healing, anti-inflammatory, analgesic, antioxidant, mild antibacterial, immunomodulatory and anti-ulcer [3, 4]. Plantain extracts have an expectorant effect, contain mucus (polysaccharides) [5], which has a softening and soothing effect on the mucous membrane of the respiratory tract.

Flowers of *Malva sylvestris* L. contain up to 10 % mucus. It is composed of l-rhamnose, d-galactose, d-galacturonic acid, and d-glucuronic acid, and they also contain flavonoids, phenolic acids, anthocyanosides, anthocyanidin, tannins [10]. Extracts of flowers and leaves of mallow (*Malva sylvestris* L.) are used at the inflammatory diseases of the oral cavity and respiratory tract, both in folk and traditional medicine [8, 9]. They suppress the cough reflex at the level of the receptors stimulation.

Mucinase mucus of *Malva sylvestris* L. and *Plantago lanceolata* L. creates a protective layer on the mucous membrane of the respiratory tract, thereby reducing the irritation of the cough receptors located in this area, facilitate respiration, and reduce the exhausting unproductive cough [6, 8].

Therefore, the combination of *Plantago lanceolata* L. leaves and *Malva sylvestris* flowers extracts in one dosage form is rational for the development of the composition and technology of tablets for the treatment of cough and colds of the respiratory system.

The aim of the work. Studying the excipients influence on the process of wetting and granulation, mass loss, flowability and bulk density of the compression mixture, the compressing process and the tablets appearance in order to develop combined tablets based on *Malva sylvestris* flowers and *Plantago lanceolata* L. leaves dry extracts by method of wet granulation.

Materials and Methods. The main active substances are dry extracts of *Malva sylvestris* flowers and *Plantago lanceolata* leaves, 16 excipients – pharmaceutical factors. The tablets were obtained by the method of wet granulation. Investigation of the influence of excipients on the flowability and bulk density of compression mixture were carried out in accordance with the requirements of the State Pharmacopoeia [1]. The evaluation of wetting, granulation and compressing processes and the tablets appearance were carried out by a five-point scale. The mass loss at the wetting and granulation was determined as a percentage.

Results and Discussion. Taking into account the technological properties of *Malva sylvestris* L. and *Plantago lanceolata* L. dry extracts, it was decided to use the method of wet granulation for obtaining of tablets based on these extracts. To develop composition and technology of these tablets we had to select the optimal excipients. The list of excipients (factors and their levels) that were studied is given in Table 1.

The ratio of components per tablet was as follows:

Mixture of <i>Malva sylvestris</i> L. and <i>Plantago lanceolata</i> L. dry extracts	33 ± 1 %
Fillers (factor A)	54 ± 1 %
Disintegrants (factor B)	7 ± 0.5 %

Moisture regulators (factor C)	5 ± 0.5 %
Magnesium stearate	1 ± 0.1 %

The calculated amounts of *Malva sylvestris* L. flowers and *Plantago lanceolata* L. leaves dry extracts were mixed. After that excipients (moisture regulators (factors C), disintegrants (factors B), and fillers (factors A)) were added. The obtained mixture was wetted with the required amount of binder solution (factors D) and granulated. After the drying we carried out the dry granulation. The obtained granulate was powdered with magnesium stearate and compressed on a laboratory tablet press.

To study the influence of four factors and their levels on the technological properties of the compression mixture and the appearance of the tablets based on *Malva sylvestris* L. and *Plantago lanceolata* L. dry extracts 4x4 Greek-Latin square has been used [11]. The matrix of the experiment planning and results are given in Table 2.

For statistical processing of the obtained results, the dispersion analysis, four-factor experiment, was used. In order to identify factors that have an influence on the studied indicators, the Fisher test was calculated. If its experimental value is more than tabular, factor is meaningful.

Evaluation of the processes of wetting and granulation (y_1) was conducted on a 5-point scale according to the following criteria:

- the mixture was homogeneous at the rubbing, the processes of wetting and granulation passed without complication, the lumps were not formed, the granules were homogeneous – 5 points;
- the process of wetting and granulation passed without complication, small lumps were easily rubbed – 4 points;
- the mixture became a viscose at the wetting, effort were applied for the grinding, the granules were hard – 3 points;

Table 1. Pharmaceutical factors and their levels are studied at the creating of the tablets based on *Malva sylvestris* L. and *Plantago lanceolata* L. dry extracts

Factors	Factors levels
Factor A – fillers	a ₁ – saccharose a ₂ – lactose monohydrate a ₃ – micro crystalline cellulose (MCC) 101 a ₄ – micro crystalline cellulose (MCC) 102
Factor B – disintegrants	b ₁ – potato starch b ₂ – polyplazdone XL-10 b ₃ – sodium croscarmellose b ₄ – sodium carboxymethyl starch
Factor C – moisture regulators	c ₁ – light magnesium carbonate c ₂ – silicon dioxide colloidal anhydrous c ₃ – neuselin US-2 c ₄ – neuselin UFL-2
Factor D – binding substances	d ₁ – 5 % starch solution d ₂ – 5 % methyl cellulose MC-15 solution d ₃ – 5 % hydroxypropylmethylcellulose alcohol solution (HPMC) d ₄ – 5 % plasdon K-25 alcohol solution

Table 2. 4x4 Greek-Latin square and results of the investigation the influence of various groups of excipients on the technological properties of the compression mixture and compressing process of the tablets based on the *Malva sylvestris L.* and *Plantago lanceolata L.* dry extracts

No batch	Factors				Indicators (technological properties of the <u>compression mixture</u> and compressing process)											
	A	B	C	D	y_1	y_1'	y_2	y_2'	y_3	y_3'	y_4	y_4'	y_5	y_5'	y_6	y_6'
1	a ₁	b ₁	c ₁	d ₁	2.0	1.5	7.98	7.85	5.88	5.81	0.75	0.74	5	5	3.0	2.5
2	a ₁	b ₂	c ₂	d ₄	4.0	3.5	0.97	1.03	9.80	9.72	0.47	0.44	5	5	4.5	5.0
3	a ₁	b ₃	c ₃	d ₂	2.0	1.5	5.25	5.35	6.18	6.11	0.69	0.66	5	5	3.5	4.0
4	a ₁	b ₄	c ₄	d ₃	1.5	1.5	3.58	3.66	6.38	6.29	0.65	0.62	5	5	4.5	4.0
5	a ₂	b ₁	c ₂	d ₃	2.5	3.0	1.95	2.01	6.12	6.08	0.55	0.52	5	5	4.5	4.0
6	a ₂	b ₂	c ₁	d ₂	2.0	2.5	3.67	3.58	5.69	5.61	0.62	0.59	5	5	4.0	4.5
7	a ₂	b ₃	c ₄	d ₄	4.5	4.0	0.76	0.71	16.09	15.98	0.49	0.46	3	2	3.5	3.0
8	a ₂	b ₄	c ₃	d ₁	3.5	4.0	5.78	5.95	5.47	5.43	0.67	0.64	4	5	4.5	4.0
9	a ₃	b ₁	c ₃	d ₄	4.5	4.0	0.35	0.31	39.49	39.10	0.33	0.30	5	5	3.5	4.0
10	a ₃	b ₂	c ₄	d ₁	4.0	4.5	2.65	2.58	7.76	7.69	0.39	0.36	4	5	4.0	4.5
11	a ₃	b ₃	c ₁	d ₃	5.0	4.5	4.32	4.44	11.59	11.42	0.41	0.38	5	5	5.0	4.5
12	a ₃	b ₄	c ₂	d ₂	3.5	4.0	4.01	4.08	8.76	8.68	0.42	0.39	5	5	4.0	4.5
13	a ₄	b ₁	c ₄	d ₂	4.0	3.5	3.90	3.82	8.32	8.25	0.41	0.38	5	5	2.5	2.5
14	a ₄	b ₂	c ₃	d ₃	4.5	5.0	2.63	2.79	10.40	10.29	0.43	0.40	5	5	4.5	4.0
15	a ₄	b ₃	c ₂	d ₁	4.0	3.5	3.34	3.22	8.77	8.64	0.40	0.37	4	5	3.0	3.0
16	a ₄	b ₄	c ₁	d ₄	4.0	4.5	0.42	0.46	30.66	30.52	0.38	0.35	5	4	4.0	4.5

Remarks: y_1 i y_1' – processes of wetting and granulation of the first and second batches of experiments respectively, points;

y_2 i y_2' – the mass loss at the wetting and granulation of the first and second batches of experiments respectively, %;

y_3 i y_3' – the granules flowability of the first and second batches of experiments respectively, sec/100 g;

y_4 i y_4' – the granules bulk density of the first and second batches of experiments respectively, g/cm³;

y_5 i y_5' – the tablets compression process of the first and second batches of experiments respectively, points;

y_6 i y_6' – the tablets appearance of the first and second batches of experiments respectively, points.

– the wetted mixture was viscous, difficult to rub, the obtained granules were hard, effort were applied for the grinding – 2 points;

– the wetted mixture was very viscous, difficult to rub, the obtained granules were hard, difficult to rub off – 1 point.

Also, the presence of the phenomenon of adhesion of mixture to the mortar at the wetting was taken into account at the estimation.

Obtained results were summed up and we found the average value for each of the investigated factor levels. It was necessary to determine which group of excipients had the biggest influence on the process of granulation and which excipients improved or complicated the granulation process. To reflect their influence, we built the ranging rows of the advantages in which qualitative factors were placed in a sequence that depends on the magnitude of their influence on the studied indicators.

Ranging row of the advantages for the influence of qualitative factors on the wetting and granulation processes (y_1) is: A > D > res > B. Factor C was statistically insignificant. The «res» sign indicates that there is an interaction between the levels of the studied

factors – the influence of the one factor levels depends on levels another factor.

The influence of the most significant factor A (fillers), on the wetting and granulation processes of the compression mixture contained *Malva sylvestris L.* and *Plantago lanceolata L.* dry extracts is shown in Fig. 1.

As can be seen from the Fig. 1, the best processes of wetting and granulation were when the fillers MCC 101 (4.25 points) and MCC 102 (4.12 points) were used. These excipients had an advantage over lactose monohydrate (3.25 points) and saccharose (2.18 points).

The ranging row of the advantages for binders is: 5 % alcohol solution K-25 (4.12 points), 5 % alcohol solution of HPMC (3.43 points), 5 % starch solution (3.37 points), 5 % solution of MC-15 (2.87 points).

The wetting and granulation processes of the compression mixture were the best when polyplazdon XL-10 was used as disintegrant (3.75 points). Sodium croscarmellose (3.6 points), sodium carboxymethyl starch (3.37 points) and potato starch (3.12 points) were placed next in the ranging row of the advantages.

Mass loss of compression mixture is possible during the technological stages of wetting and granulation.

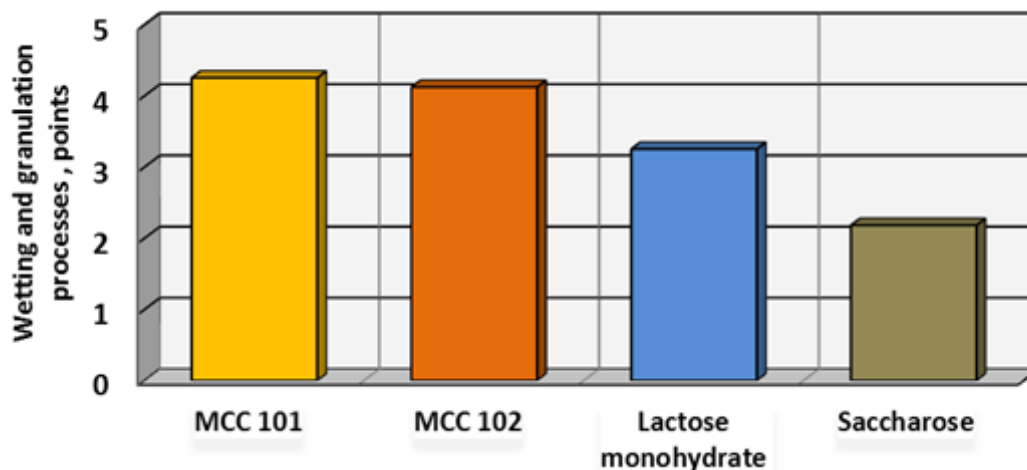


Fig.1. Fillers influence on the wetting and granulation processes of the compression mixture

Therefore, they are important for maintaining of the content uniformity in the obtained tablets.

The ranging row of the advantages for the influence of factors on the mass loss at the wetting and granulation (y_2) is: $D > A > C > res > B$. The effect of the most significant factor D (binding substances) on mass loss at the wetting and granulation processes is shown in Fig. 2.

The smallest mass loss during granulation was obtained using 5 % alcohol solution of plasdon K-25 (0.62 %), which had advantage over 5 % alcoholic solution of HPMC (3.17 %), 5 % solution of MC-15 (4.21 %) and 5 % starch solution (4.92 %).

Among the studied fillers, MCC 102 (2.57 %) and MCC 101 (2.83 %) provided the smallest mass loss at the granulation. The indicated excipients had an advantage over lactose monohydrate (3.05 %) and saccharose (4.46 %).

Moisture regulators silicon dioxide colloidal anhydrous (2.57 %) and neuselin UFL-2 (2.71 %) equally influenced on the mass loss at the wetting and granulation and they had an advantage over neuselin US-2 (3.55 %) and light magnesium carbonate (4.08 %).

The lowest mass loss at the wetting and granulation was obtained using the polyplazdone XL-10 as disintegrant (2.48 %), which had an advantage over sodium croscarmellose (3.42 %), sodium carboxymethyl starch (3.48 %), and potato starch (3.52 %).

The studied factors can be placed as follows: $D > C > B > res$ depend on the influence on the flowability of the compression mixture (y_3). The effect of the most significant factor D (binders) on the compression mixture flowability is shown in Fig. 3.

It has been established that the best flowability of the compression mixture was when starch solution was used as a binder (6.93 sec/100 g), which had an advantage over MC-15 (7.20 sec/100 g), alcohol solution of HPMC (8.57 sec/100 g) and solution of the K-25 (23.92 sec/100 g).

The effect of fillers on the compression mixture flowability can be illustrated by the following ranging row of the advantages: saccharose (7.02 sec/100 g), lactose monohydrate (8.31 sec/100 g), MCC 102 (14.48 sec/100 g), and MCC 101 (16.81 sec/100 g).

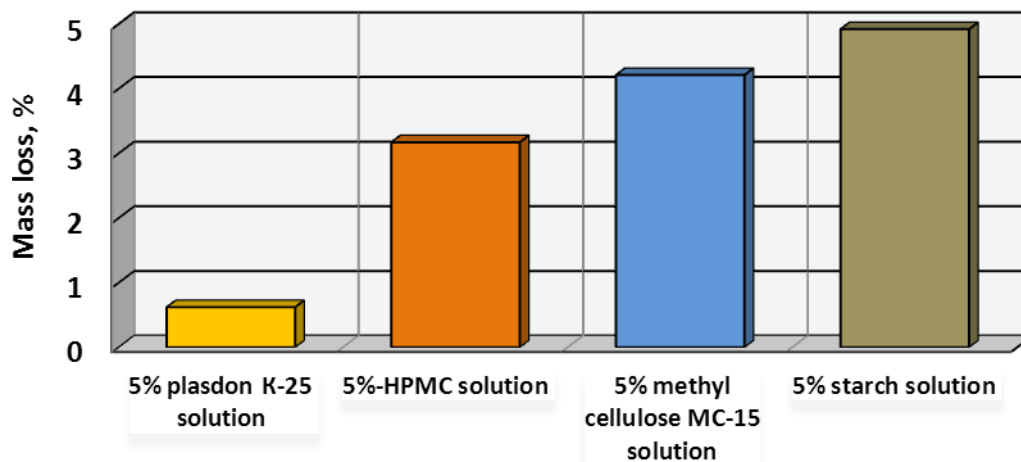


Fig. 2. Binders influence on the mass loss at the wetting and granulation processes of the compression mixture

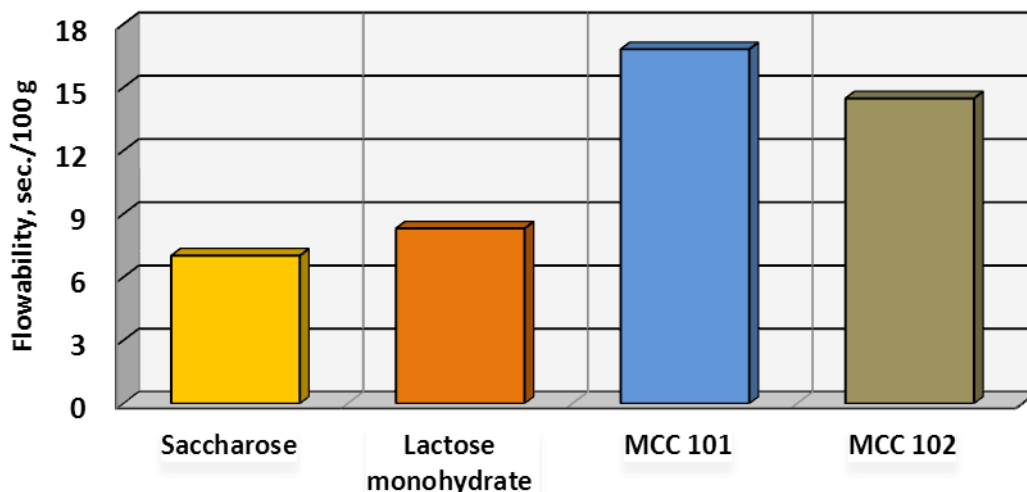


Fig. 3. Binders influence on the flowability of the compression mixture

The ranging row of the advantages for moisture regulators depending on influence on the compression mixture flowability is: silicon dioxide colloidal anhydrous (8.32 sec/100 g), neuselin UFL-2 (9.60 sec/100 g), light magnesium carbonate (13.4 sec/100 g), neuselin US-2 (15.31 sec/100 g).

The effect of disintegrant agents on the flowability of the compression mixture has been studied. The best flowability was at the using of the XL-10 (8.37 sec/100 g) polyplazdone, which had advantage over sodium croscarmellose (10.60 sec/100 g), sodium carboxymethyl starch (12.77 sec/100 g) and potato starch (14.88 sec/g).

The influence of the studied factors on the bulk density of the compression mixture is illustrates by the following ranging row of the advantages: A > D > C > B > res. The influence of the most significant factor A (fillers) on the bulk density of the compression mixture is shown in Fig. 4.

As can be seen from the Fig. 4, that the highest value of the bulk density of the compression mixture was obtained by saccharose introducing into the composition

of the compression mixture (0.625 g/cm³), which had an advantage over lactose monohydrate (0.562 g/cm³), MCC 102 (0.377 g/cm³) and MCC 101 (0.375 g/cm³).

Among the binders, starch solution (0.537 g/cm³) provided the largest bulk density of the compression mixture. The solution of MC-15 (0.525 g/cm³) was next in the ranging row of the advantages, after that alcohol solution of HPMC (0.500 g/cm³) and alcohol solution of plasdon K-25 (0.400 g/cm³) were placed.

The influence of moisture regulators on the bulk density of the compression mixture can be illustrated by the following ranging row of the advantages: light magnesium carbonate (0.525 g/cm³), neuselin US-2 (0.475 g/cm³), neuselin UFL-2 (0.475 g/cm³), silicon dioxide colloidal anhydrous (0.45 g/cm³).

The highest value of the bulk density of the compression mixture was obtained using sodium carboxymethyl starch as disintegrant agents (0.512 g/cm³), which had an advantage over potato starch (0.500 g/cm³), sodium croscarmellose (0.478 g/cm³) and polyplazdone XL-10 (0.462 g/cm³).

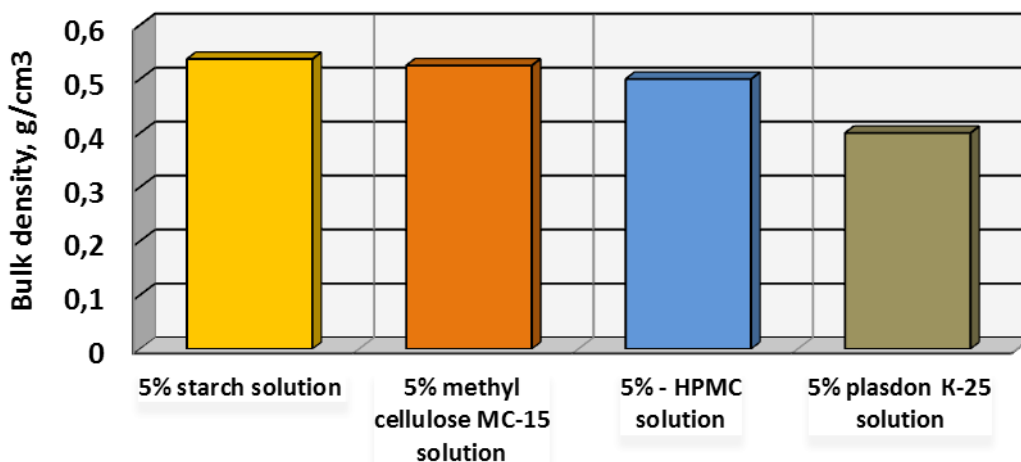


Fig. 4. Binders influence on the bulk density of the compression mixture

Taking into account that the filling of tablets press die with granules was appropriate in all batches, the evaluation of the compressing process (y_5) was carried out only according to the mixture adhesion to the press tool. For the evaluation of the compressing process 5-point scale was used according to the following criteria:

- Tablets do not stick to punches, press tool was clean – 5 points;
- Tablets do not stick to punches, press tool was clean, and at the compression we can hear creak – 4 points;
- Tablets do not stick to the punches, but there is a plaque on the punches, at the compression we can hear creak – 3 points;
- Tablets stick to punches – 2 points.

The ranging row of the advantages for reflecting the influence of studied factors on the process of the compressing tablets based on *Malva sylvestris L.* and *Plantago lanceolata L.* dry extracts is: $D > A = B > C$. The influence of the most significant factor D (binders) on the tablets compressing process is shown on Fig. 5.

Fig. 5 illustrates that the best tablets compression process was performed with using the solution of MC-15 (5.0 points) and alcohol solution of HPMC (5.0 points), which had an advantages over the starch solution (4.62 points) and the alcohol solution of the plasdon K-25 (4.25 points).

Among the studied fillers, saccharose (5.00 points) had advantage over MCC 101 (4.87 points), MCC 102 (4.75 points) and lactose monohydrate (4.25 points).

The ranging row of the advantages for the disintegrant agents depend on influence on the process of tablets compressing is: potato starch (5.0 points), polyplazdone XL-10 (4.87 points), sodium carboxymethyl starch (4.75 points), sodium croscarmellose (4.25 points).

The moisture regulators: colloidal anhydrous silicon dioxide (4.87 points), light magnesium carbonate (4.87 points), neuselin US-2 (4.87 points) equally influenced

on the process of tablets compressing and had an advantage over neuselin ULF-2 (4.25 points).

The evaluation of the tablets appearance (y_6) was performed according to the quality of the tablets surface and its color homogeneity with a 5-point scale, taking into account the following criteria:

- the surface of the tablets had a good shine, the edges of the tablet were equal and without defects – 5 points;
- the surface of the tablets had a slight shine, the edges of the tablets were equal – 4 points;
- the surface of the tablets had a slight shine, but it was not smooth – 3 points;
- the surface of the tablet had not a shine, there were overdone – 2 points.

To assess the color of the tablet, the following criteria were selected:

- Tablets had homogeneous color, no inclusions – 5 points;
- Tablets had homogeneous color, with small inclusions – 4 points;
- Tablets had not homogeneous color, with inclusions – 3 points;
- Tablets had non-uniform color, with inclusions – 2 points.

The results of the evaluation of the tablets appearance and color were summed up and we found the average value.

The influence of the studied factors on the tablets appearance was as follows: $B > D > A > C = res$. The effect of the most significant factor B (disintegrants) on the tablets appearance is shown in Fig. 6.

A ranging row of the advantages for disintegrants due to their effect on the tablets appearance is: polyplazdone XL-10 (4.37), sodium carboxymethyl starch (4.25), sodium croscarmellose (3.75), and potato starch (3.37).

The effect of binders on the tablets appearance is illustrated by the following ranging row of the advantages: 5 % alcohol solution of HPMC (4.37 points), 5 % alcohol

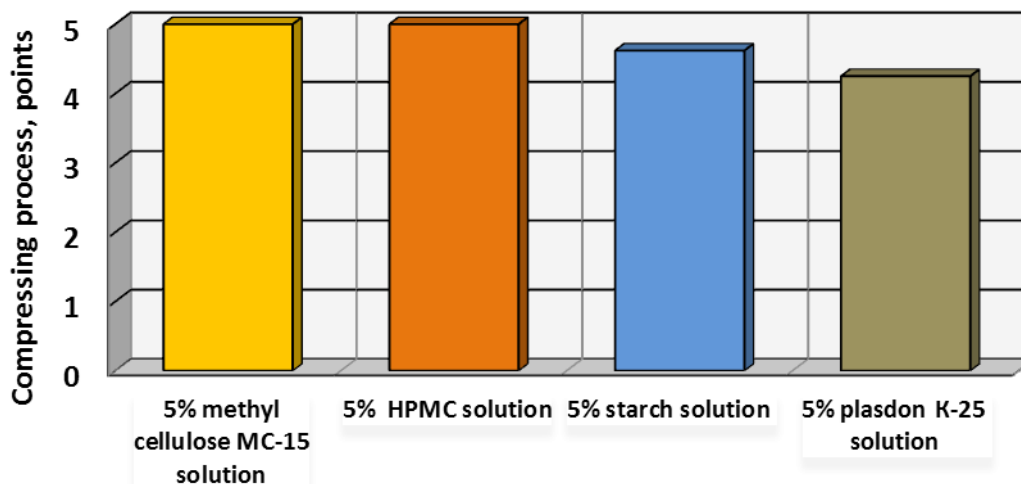


Fig. 5. Binders influence on the tablets compressing process

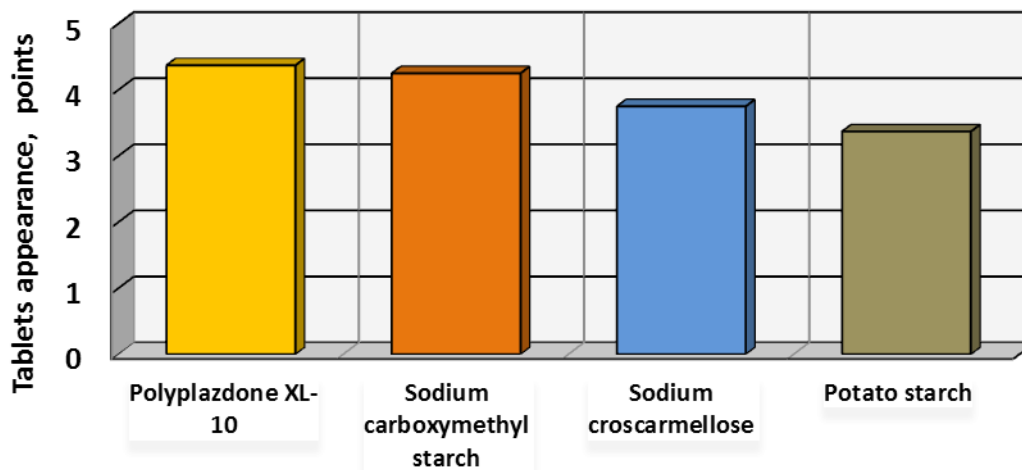


Fig. 6. Disintegrants influence on the tablets appearance

solution of plasdon K-25 (4.00 points), 5 % solution of MC-15 (3.75 points), 5 % solution of starch (3.62 points).

Among the studied fillers, MCC 101 (4.25 points) provided the best tablets appearance, it had advantage over lactose monohydrate (4.00 points), saccharose (3.87 points), and MCC 102 (3.50 points).

The best tablets appearance we have got at the using of silicon dioxide colloidal anhydrous as moisture regulators (4.12 points); neuselin US-2 (4.00 points) was next in the ranging row of the advantages; light magnesium carbonate (4.00) had an advantage over neuselin UFL-2 (3.62 points).

Conclusions:

1. The influence of 4 qualitative factors on the compression mixture technological properties, the compressing process and appearance of the tablets based on the *Malva sylvestris L.* and *Plantago*

lanceolata L. dry extracts were studied with using the mathematical planning of the experiment (4x4 Greek-Latin square).

2. The ranging rows of the advantages for excipients influence on the technological properties of the compression mixture and compressing process of the tablets based on *Malva sylvestris L.* and *Plantago lanceolata L.* dry extracts were constructed. The influence of 16 excipients on the process of wetting and granulation, flowability and bulk density of the compression mixture, compressing process and tablets appearance were investigated. The excipients which showed the best results of the studied parameters were selected for the further study at the development of the optimal composition and technology of tablets based on *Malva sylvestris L.* and *Plantago lanceolata L.* dry extracts.

ДОСЛІДЖЕННЯ ВПЛИВУ ФАРМАЦЕВТИЧНИХ ФАКТОРІВ НА ТЕХНОЛОГІЧНІ ВЛАСТИВОСТІ МАСИ ДЛЯ ТАБЛЕТУВАННЯ І ДЕЯКІ ПОКАЗНИКИ ЯКОСТІ ТАБЛЕТОК НА ОСНОВІ СУХИХ ЕКСТРАКТІВ МАЛЬВИ ЛІСОВОЇ І ПОДОРІЖНИКА ЛАНЦЕТОЛИСТОГО

С. Я. Белей¹, Т. А. Groшовий², Н. М. Белей²

ТОВ «Тернофарм»¹, Тернопіль

ДВНЗ «Тернопільський державний медичний університет імені І. Я. Горбачевського МОЗ України»²
beley@tdmu.edu.ua

Мета роботи. Вивчення впливу допоміжних речовин на процес зволоження та грануляції, втрату в масі, текучість і насипну густину маси для таблетування, процес пресування та зовнішній вигляд таблеток з метою розробки нового комбінованого таблетованого лікарського засобу на основі сухих екстрактів квітів мальви лісової і листя подорожника ланцетолистого методом вологої грануляції.

Матеріали і методи. Основні діючі речовини – сухі екстракти з квітів мальви лісової та листя подорожника ланцетолистого, 16 допоміжних речовин, які були згруповані в 4 групи фармацевтичних факторів. Таблетки отримували методом вологої грануляції. Дослідження впливу допоміжної речовини на такі показники, як текучість і насипну густину маси для таблетування, проводили відповідно до вимог ДФУ, 2 видання. Оцінку процесу зволоження і грануляції, процесу пресування і зовнішнього вигляду таблеток проводили за п'ятибальною шкалою. Втрату в масі при зволоженні та грануляції визначали у відсотках.

Результати й обговорення. Враховуючи результати досліджених фармако-технологічних властивостей сухих екстрактів мальви лісової і подорожника ланцетолистого, для виготовлення таблеток було вирішено використати метод вологої грануляції. Для цього необхідно підібрати склад – раціональні допоміжні речовини і розробити технологію даної лікарської форми. В статті наводяться результати дослідження впливу різних груп допоміжних речовин та їх представників на технологічні властивості маси для таблетування і процес пресування при розробці складу і технології таблеток на основі екстрактів мальви лісової та подорожника ланцетолистого за допомогою математичного планування експерименту. Найкращі відгуки було отримано при використанні таких допоміжних речовин, як сахароза, лактози моногідрат, МКЦ 101 і 102, неуселін UFL-2, аеросил, розчин плаздону К-25.

Висновки. За допомогою чотирифакторного експерименту – греко-латинського квадрату встановлено вплив 4-х якісних факторів на основні властивості маси для таблетування, процес пресування і зовнішній вигляд таблеток на основі сухих екстрактів мальви лісової та подорожника ланцетолистого. Це дозволить звужити коло допоміжних речовин для подальшої розробки оптимального складу і технології таблеток, використання яких дасть можливість отримати таблетовану лікарську форму із стабільними показниками якості в умовах промислового виробництва.

Ключові слова: фармацевтичні фактори; технологічні властивості; маси для таблетування; таблетки; екстракти мальви лісової та подорожника ланцетолистого.

ИССЛЕДОВАНИЕ ВЛИЯНИЯ ФАРМАЦЕВТИЧЕСКИХ ФАКТОРОВ НА ТЕХНОЛОГИЧЕСКИЕ СВОЙСТВА МАССЫ ДЛЯ ТАБЛЕТИРОВАНИЯ И НЕКОТОРЫЕ ПОКАЗАТЕЛИ КАЧЕСТВА ТАБЛЕТОК НА ОСНОВЕ СУХИХ ЭКСТРАКТОВ МАЛЬВЫ ЛЕСНОЙ И ПОДОРОЖНИКА ЛАНЦЕТОЛИСТНОГО

С. Я. Белей¹, Т. А. Грошовый², Н. Н. Белей²

ООО «Тернофарм»¹, Тернополь

ГВУЗ «Тернопольский государственный медицинский университет имени И. Я. Горбачевского МЗ Украины»²

beley@tdmu.edu.ua

Цель работы. Изучение влияния вспомогательных веществ на процесс увлажнения и грануляции, потерю в массе, текучесть и насыпную плотность массы для таблетирования, процесс прессования и внешний вид таблеток с целью разработки нового комбинированного таблетированного лекарственного средства на основе сухих экстрактов цветов мальвы лесной и листьев подорожника ланцетолистого методом влажной грануляции.

Материалы и методы. Основные действующие вещества – сухие экстракты из цветов мальвы лесной и листьев подорожника ланцетолистого, 16 вспомогательных веществ, которые были сгруппированы в 4 группы фармацевтических факторов. Таблетки получали методом влажной грануляции. Исследование влияния вспомогательных веществ на такие показатели, как текучесть и насыпную плотность массы для таблетирования проводили в соответствии с требованиями ГФУ, 2 издания. Оценку процесса увлажнения и грануляции, процесса прессования и внешнего вида таблеток проводили по пятибалльной шкале. Потерю в массе при увлажнении и грануляции определяли в процентах.

Результаты и обсуждение. Учитывая результаты исследованных фармако-технологических свойств сухих экстрактов мальвы лесной и подорожника ланцетолистого, для изготовления таблеток было решено использовать метод влажной грануляции. Для этого необходимо подобрать состав – рациональные вспомогательные вещества и разработать технологию данной лекарственной формы. В статье приводятся результаты исследования влияния различных групп вспомогательных веществ и их представителей на технологические свойства массы для таблетирования и процесс прессования при разработке состава и технологии таблеток на основе экстрактов мальвы лесной и подорожника ланцетолистого с помощью математического планирования эксперимента. Лучшие отзывы были получены при использовании таких вспомогательных веществ, как сахароза, лактоза, МКЦ 101 и 102, неуселин UFL-2, аеросил, раствор плаздон К-25.

Выводы. С помощью четырехфакторного эксперимента – греко-латинского квадрата, установлено влияние 4-х качественных факторов на основные свойства массы для таблетирования, процесс прессования и внешний вид таблеток на основе сухих экстрактов мальвы лесной и подорожника ланцетолистого. Это позволит сузить круг вспомогательных веществ для дальнейшей разработки оптимального состава и технологии таблеток, что позволит получить таблетированную лекарственную форму со стабильными показателями качества в условиях промышленного производства.

Ключевые слова: фармацевтические факторы; технологические свойства; массы для таблетирования; таблетки; экстракты мальвы лесной и подорожника ланцетолистого.

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