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Effect of cmc-na concentration as a binder in the formulation of *chewable tablets* of ethanol extract of onion tubers (*allium cepa* l.)

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Abstract. Shallots (*Allium cepa* L.) are agricultural commodities that are grown continuously in Brebes Regency and are useful as antidiabetic drugs because they contain flavonoid compounds that are hypo glycemia. Shallot bulbs cause a bitter taste and odor so that they are not comfortable to consume directly, so *chewable* tablets are made with modifications of CMC-Na binding material to increase the intragranular and intergranular force of the tablets. This study aims to determine the influence of variations in CMC-Na concentration as a binding agent on granules, physical properties and respondents' preferences for *chewable* tablet preparations. Shallot bulb extract was extracted by maceration method for 3 days using 70% ethanol and then formulated CMC-Na with concentrations of F1 (3%), F2 (4%) and F3 (5%). The test results showed that the increase in CMC-Na concentration led to an increase in flow properties, granule moisture content and decreased the compressibility value and dwell angle of the granules. The statistical results of the physical properties of the granules showed a p-value<0.05, which had a significant effect on the physical properties of the granules. The results of the physical property test showed that the increase in CMC-Na concentration caused the hardness of the tablets to increase so that the fragility was low and the crushing time was getting longer or increasing. The statistical results of testing the physical properties of the tablets showed a p-value<0.05, which had a significant effect on the physical properties of the tablets. Based on the results of the ranking score of the preference test, respondents prefer F3 with a ranking score percentage of 34,62 %.

1 Introduction

Shallots (*Allium cepa* L.) is one of the agricultural commodities that is grown continuously in Brebes Regency. Brebes Regency is an important producer of shallots in Central Java, Indonesia. The average amount of shallots produced perunit area of land or per plant during one period is 9.69 t/ha. This amount is smaller than the potential of 11.10 t/ha (6). Shallots

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have many health benefits, one of which can be used as an antidiabetic drug.

Previous research has stated that ethanol extract of onion bulbs (*Allium cepa* L.) can be used as an antidiabetic drug because it contains flavonoid compounds that are hypo glycemia (4). In Kurniawan's research *et al* (2017) also stated that "shallot root extract has the potential as an oral antidiabetic with a dose of 8.57 mg/200g BB in rats. If the dose is converted in humans, it is equivalent to 3000mg/70Kg of human body weight per day. The dose can be used as a divided dose where the administration of the drug is carried out 3 times a day, each time taking 2 tablets with a dose of 500mg each" (27).

Shallot bulbs cause a bitter taste and an uncomfortable smell if consumed directly, so in this study modifications were made to make tablets into tablets *chewable* to reduce the discomfort that may arise from consuming onion bulbs directly. In the case of very high blood sugar levels, oral drugs with quick reactions can be used to lower blood sugar levels quickly so the use of tablets *chewable* can be an option in its treatment due to the advantages of tablets *chewable* which can absorb drugs faster and have better bioavailability with a disintegration process that improves dissolution (25).

Tablets *chewable* is a tablet whose use in *chewable* between the teeth before being swallowed in the gastrointestinal tract. Tablets use *chewable* and widely liked for having a great taste and soft texture (25). Tablets *chewable* It have the advantage of being able to absorb drugs faster and has better bioavailability with a disintegration process that improves dissolution.

Tablet manufacturing *chewable* not only active ingredients and only sweeteners are used but there are other components contained inside. Excipient components in tablets *chewable* include binders, lubricants, crushers, sweeteners, and fillers. The selection of binding materials in modifying tablets *chewable* aims to improve the intragranular and intergranular force so that a tablet is formed that meets the requirements of tablet weight, tablet hardness and tablet brittleness (20). The binding material used is CMC-Na *Carboxymethylcellulose sodium* is a chemical compound that is usually utilized as a binding agent in various pharmaceutical preparations and in the manufacture of granules containing CMC-Na shows good flowability and compressibility levels (3).

Results showed that the concentration of CMC-Na 3% in formula II of the aspiration tablet preparation of glodokan leaf extract had good physical properties, namely hardness, brittleness, and qualifying crushing time (3). Based on this description, it is necessary to conduct research for the manufacture of tablets *chewable* Ethanol extract of onion bulbs (*Allium cepa* L.) with a concentration of CMC-Na (3%, 4%, 5%) as a binding agent (3).

2 Methods

2.1. Types of researchers

The research employed a laboratory experimental method, encompassing material preparation, plant identification, production of ethanol extracts from onion tubers (*Allium cepa* L.), and the formulation of

wet granulation and chewable tablets. Conducted at the Research Laboratory of Harapan Bangsa University and the Biology Laboratory of Muhammadiyah University, the study evaluated the physical properties of the chewable tablets made from the ethanol extract of onion tubers. Preference tests for these tablets were also performed. All collected data were analyzed using IBM SPSS 22, specifically applying the One-Way ANOVA test to assess the differences among the various formulations (21).

2.2. Tools and Materials

2.2.1. Tool

The tools used in this study are analytical scales (*Ohaus*), *rotary evaporators*, maceration vessels (*Pyrex*), ovens (*Memmert),* single punch *tablet printing machines* (Local), *friability testers* (Unilab), *hardness testers* (Local), mortars and stampers, sieves with mesh numbers 16, 20 and 60*, glassware* (Pyyrex and Iwaki), *stopwatches,* blender (*Philips*), *aluminum foil* (*Cling*).

2.2.2. Material

The ingredients used in this study are onion bulb extract *(Allium cepa* L.*)***,** 70% ethanol, aerosil, CMC-Na, lactose, SSG, mg stearate, talcum, sucrose and mannitol.

2.3. Formulation

Chewable tablets containing ethanol extract of onion tubers are made with a weight of 750 mg per tablet and are made in 3 formulas with different concentrations of CMC-Na binding agents, namely 3%, 4%, and 5% (w/v) as many as 50 tablets per formula.

Table 1. Chewable Formulation

Ingredient	**Functional**	**Composition (%)**		
		F1	**F2**	**F3**
Shallot bulbs	Active substances	66,66	66,66	66,66
CMC-Na	Binding Materials	3	4	5
Lactose	*Filler binder*	10,37	10,37	10,37
SSG	Disintegrant	8	8	8
Mg Stearate	Lubricant	3	3	3
Talkum	Anti-stick	5	5	5
Sucrose	Filler	0,99	0,74	0,49
Mannitol	Filler	2,98	2,23	1,48
Source (3) with modifications				
FI : Active substance 66.66% with the addition of CMC-Na 3% FII: Active substance 66.66% with the addition of CMC-Na 4% FIII : Active substance 66.66% with the addition of CMC-Na 5%				

The ingredients that have been prepared are weighed one by one according to the formula, then the manufacture of dry extracts is made by adding aerosils mixed with thick extracts in a ratio of (2:1) (29). Add mannitol, sucrose and CMC-Na that have been developed with aquadest in the hot state. The already homogeneous mixture is added lactose, starch 1500 and stevia sugar are ground in a mortar until all are homogeneous. Then the granules that have been obtained are sifted with sieve number 8 mesh and dried in a dryer cabinet until a constant weight is obtained (29).

Table 2. Randement Of Onion Bulb Extract

Sample	Simplisia	Extract	% Randement
Shallot bulbs (*Allium cepa* L.)	1.200 grams	441.55 grams	36.79%

Organoleptic results in onion bulb extract (*Allium cepa* L.) has a distinctive smell of shallots, dark red in color with a thick texture. This is in line with research from shallot tuber tablets which obtained dark brown extracts, thick shapes with the smell of shallots (27).

Yield results from shallot bulb extract (*Allium cepa* L.) which was remaged for 3 days obtained a thick extract A total of 441.55 grams with a yield percentage of 36.79%. The results have met the requirements of the Indonesia Herbal Pharmacopoeia, which is not less than 10% (12).

2.4. Results Of Making Shallot Bulb Ethanol Extract Granules

Granules are clumps of particles that are interconnected binding with a certain force. The granule manufacturing in this study was carried out by the wet granulation method with the aim of increasing the cohesion and compressibility of the powder and preventing the separation of mixed components in the tablet manufacturing process (15)(43).

Wet granules in this study were made tablets per tablet weight of 750 mg with the number of tablets per formula 250 tablets. In the manufacture of *chewable tablets*, ingredients are used with the composition of each formula with the same number of preparations according to Table 1.

Table 3. Granule Material of Onion Bulb Extract (*Allium Cepa* L.)

Material	Composition (mg)		
	F1	F2	F3
Shallot bulb extract	125	125	125
Lactose	19,442	19,442	19,442
SSG (*Sodium Starch Glycolate*)	15,000	15,000	15,000
Mg Stearate	5,625	5,625	5,625
Talkum	9,375	9,375	9,375
CMC-Na	5,625	7,500	9,375
Sucrose	1,856	1,387	917,5
Mannitol	5,587	4,180	2,775

Source (Anindhita *et al.*, 2022) with modifications

The next procedure is after determining the composition per tablet, all ingredients are weighed and the production of dry extracts is continued. The dry extract is made by adding aerosil mixed with a thick extract in a ratio of (2:1). The use of aerosils in this study for each formula was 62.5 grams. The next procedure included CMC-Na which had been developed with aquades as much as 20 times the weight of CMC-Na used in the hot state (16). Next, add mannitol, sucrose to the mortar and grind until homogeneous.

The mixture that has been homogeneous in the procedure is then added with lactose and *Sodium Starch Glycolate* (SSG) is then ground in a mortar until all is mixed or homogeneous. Then the granules that have been obtained are sifted with sieve number 20 mesh and dried in a dryer cabinet with a temperature of 40°C until a constant weight is obtained for 24 hours. The purpose of drying granules is to reduce the moisture content contained in the granules so that the granules are not easily damaged and not contaminated with microbes (26). The granules that have been dried in the oven and gain a constant weight are then added with mg stearate and talcum as the final phase and sifted with sieve number 40 mesh.

The following are the results of the evaluation of granules carried out in this study including flow rate, stationary angle, compressibility and moisture content of shallot bulb ethanol extract granules. The purpose of evaluating the characteristics of these granules is to provide quality assurance to the tablets to be produced.

3.3.1 Granule Stationary Corner

The stationary angle test is carried out to determine the maximum angle formed by the powder surface with the horizontal surface at the time of testing (5). A good granule has a very good 25-30° resting angle and 31-35° good then it flows freely (*Free flowing*) (5).

Table 4. Granule Stationary Angle Results

Formula	Silent angle (°)	*p-value*
F1	37.58±0.11	
F2	36.69±0.13	0.022
F3	34.40±0.76	

Table 4 shows that the results of the stationary angle test decreased with the increase of CMC-Na concentration. These results show that the granules in formula 3 have a good stationary angle because they are in the range of 34.40° (35). Granules that have a stationary angle between 31°-35° will flow well, because the flatter the cone, the smaller the angle of inclination (33).

This result is in line with the study that states that the difference in the size of the stationary angle can be influenced by the addition of CMC-Na binder material, namely the higher the concentration of CMC- Na, the smaller the stationary angle formed. The smaller the quiescent angle value, the better the granule flow properties so that the tablets have uniform weight uniformity (29).

The results in this study are in line with the tablet research *chewable* asetosal, where the results of the stationary angle test for F1, F2 and F3 were 26.86±0.11º, 26.83±0.13º and 25.86±0.56º experienced a decrease in the value of the stationary angle (35). The study explained that the results of the quiescent angle test decreased with the increase in the concentration of the binder material, so the results showed that the granules in F1-F3 had a good flow velocity and could flow freely because they were in the range of 25°-30° (35)(45).

3.3.2 Flow rate

Table 5. Granule Flow Rate Results

Formula	Flow rate (grams/sec)	*p-value*
F1	4.72±0.13	
F2	5.26±0.25	0,004
F3	6.29±0.32	

Table 5 shows that the test results obtained have a flow rate test value of F1-F3 which is in accordance with the test standard, which is 4-10 grams/second. Based on the results of the flow rate test, it is known that the granule flow rate has increased the percentage of the flow rate value. This can happen because the higher the concentration of CMC-Na used as a binder in the granules, the more mass the print can bind to facilitate flow (36).

The use of CMC-Na concentration as a binder in F1-F3 experiences concentration, which makes the granules easily flow into the printing chamber so that F1-F3 experiences a percentage of flow rate value (36)(48).

The results of this study are in line with the research of atesal chewable tablets, where the results of the flow rate test have increased, namely for F1, F2 and F3, which are 18.14±0.23 grams/second; 18.16±0.25 grams/second and 18.88±0.09 grams/second. The increase in flow rate is due to the increased concentration of binder in the granules from F1-F3 (45).

3.3.3 Compression

The compressibility test was carried out to determine the flow properties and density of the granules and the decrease in each volume due to shock (42). Granules are said to be good if they have a compressibility value of <20% (46). The results of the compressibility test in Table 6 can be seen that the granule compressibility data from F1-F3 meets the granule compressibility test standard because it is <20% and it can be seen that the percentage of granule compressibility has decreased in compressibility value.

Table 6. Granule Compressibility Results

Formula	Compressibility (%)	*p-value*
F1	18.54±0.09	
F2	13.77±0.77	0,011
F3	13.66±0.19	

The results of the compressibility test show that from F1-F3 there is a decrease where F3 has the smallest compressibility. This is in accordance with the literature stating that an increase in the concentration of CMC-Na as a binding material results in a smaller print mass compressibility value. The compressibility index is related to the flow rate of the granules. A low compressibility index value of a material indicates better flow properties than a high compressibility index value (22).

The results of this study are in line with the research of *chewable* calcium lactate tablets where in the journal the compressibility value of F1-F4 is F1 of 16.17%; F2 by 13.85%; F3 by 16.40%; and the compressibility value of F4 is 9.1%. These results show that the concentration of CMC-Na has an effect on the compressibility value of granules.

3.3.4 *Granule Moisture Content*

The purpose of the granule moisture content test is to see the percentage of moisture in the granules. In this test, the granules are dried every hour with the drying temperature used which is 40°C-60°C for 8 hours and then the weight of wet granules and the weight after drying are calculated so that the percentage of granule moisture content is obtained (41). Drying of granules is carried out with the aim of reducing the water content in the granules (17). In this study, the drying of the extract uses Aerosil, because the ability to absorb moisture is very large without losing good flow properties. Aerosil is a safe and pharmacologically inert material (17).

Granules are said to be good if they meet the granule moisture content test standards, which range from 1-5% (2). The results of the moisture content test show that from F1-F3 meet the moisture content test standards, so the granules produced in this study are not too dry and not too moist which if the granules are too dry will cause the tablets to be easily brittle, while if the granules are too moist it will cause difficulties when printing on punches and dies (28)(46).

Table 7. Granule Moisture Content Results

Formula	**Moisture Content (%)**	**p-Value**
F1	1.56±0.15	0,000
F2	2.61±0.22	
F3	3.83±0.08	

Based on the test, the results were obtained that F3 has the highest moisture content compared to F1 and F2, which occurs because F3 has the highest concentration of CMC-Na compared to F1 and F2. The large concentration of CMC-Na as a binding agent causes the bonds between particles in the granule powder to become stronger so that when the moisture content is dried, the water content from the outside of the granule to the inside that has a strong bond of powder particles will experience less evaporation which causes the granules in F3 to have the highest moisture content followed by F2 and F1 have the lowest moisture content (41).

2.5. Results Of Making Shallot Bulb Ethanol Extract Granules

3.4.1 Organoleptic Test

Table 8. Organoleptic test results *of chewable tablets*

Formula	Organoleptics			Standard
	Color	Aroma	Shape	
F1	Brownish white	Shallot	Round	Brownish-white to brown color, distinctively scented, rounded in shape (Ambaro et al., 2020).
F2	Light brown	Shallot	Round	
F3	Brown	Shallot	Round	

Information:
F1 = Active substance 66.66% with the addition of CMC-Na 3%
F2 = Active substance 66.66% with the addition of CMC-Na 4%
F3 = Active substance 66.66% with the addition of CMC-Na 5%

Organoleptic testing is carried out by observing the color, smell and shape of the tablets *chewable* Extraction of shallot bulbs (*Allium cepa* L.) that has been created in visualization (30). Organoleptic tests are intended for tablet preparations *chewable* made may give indications of damage and deterioration of the product (30).

Organoleptic testing of tablets *chewable* Ethanol extract of onion bulbs (*Allium cepa* L.) is in accordance with the literature where the color and smell on the tablet comes from onion bulb extract, which is brownish in color and smells typical of shallots, while the shape is round because the tablet is printed in a round shape (30).

3.4.2 Uniformity Of Weight

The weight uniformity test was carried out to determine the magnitude of the deviation in the weight of the tablets (2). The weight uniformity requirement is that no more than 2 tablets deviate greater than column A and none of the deviations greater than column B. In this study, the weight per tablet *chewable* made 750mg so that the standard tablet becomes no more than 2 tablets deviating larger than column A (5%) and none deviating greater than column B (10%) (11).

Table 9. Results of chewable tablet weight uniformity test

Formula	Weight uniformity (mg)	*p-value*
F1	744.00±5.03	
F2	749.50±2.24	0,048
F3	753.50±4.89	

Table 9 shows that the three formulas meet the test standard, namely no more than 2 tablets deviate greater than column A (5%) with *Range* column A limit of 706.80-781.20 mg and none of them deviated greater than *range* the limit of column B is 669.60-818.40 mg with each result in F1 of 740-750 mg; F2 of 740-750 mg; F3 of 750-760 mg (11). These results are in line with the theory that the rapid flow of granules into the print room results in uniform weights (48).

The results of F1-F3 show that there is an increase in weight uniformity, which according

to the literature means that the weight uniformity will be better because the better the granules flow (9). This can happen because the use of CMC-Na as a binding agent on tablets will result in tablets *chewable* which is able to improve flow properties and compressibility (18).

The uniformity of the tablet weight is influenced by the compressibility of the granules and the flow properties of the granules. The better the flow properties and compressibility of the granules, the more stable the weight uniformity of the resulting tablets. In this study, for testing the flow properties and compressibility of granules, good results were obtained, which led to the uniformity of tablet weight *chewable* shallot bulb extract (*Allium cepa* L.) to be good (2). Good weight uniformity indicates the uniformity of the active substance in each tablet so that the tablet has the same therapeutic (2).

The results in this study are in line with the tablet research *chewable* Acetosal which in the journal the weight uniformity of F1-F4 is F1 (220.6 mg), F2 (220.7 mg) and F3 (220.9 mg), which the results show that the weight uniformity value has increased by percentage and has met the weight uniformity test standards (45).

3.4.3 Size Uniformity

The size uniformity test aims to evaluate the dimensions of the tablets including the thickness and diameter of the tablets with the aim of guaranteeing the consistency of the size of each tablet produced (9). Tablet size uniformity test standard chewable The good thing is that the diameter of the tablet should not be less than 1 1/3 times the thickness of the tablet and should not be more than 3 times the thickness of the tablet (13).

Table 10. Chewable Tablet Size Uniformity Test Results

Formula	***Size uniformity (cm)***		***p-Value***
	Diameter	Thick	
F1	1,2±0,0	0.5±0.0	0,046
F2	1,2±0,0	0.4±0.0	
F3	1,2±0,0	0.5±0.0	

Information: The Result are the Mean ± SD

The results of the third formula, namely F1-F3, have a diameter of 1.2 cm with a tablet thickness of 0.4-0.5 which results have met the tablet size uniformity test standard. The difference in the thickness of the tablets in this study can be caused by the large number of materials entering the mold and the pressure is not constant, while the measurement of the diameter of the tablet shows that the tablet has the same diameter because the tablet printing equipment used is the same (29).

The results of this study are the same as other studies that explain that the thickness of the tablets *chewable* This is also different where this is affected by the compression pressure, filling into the mold hole and distributing the particle size, while the results of the tablet diameter measurement have a constant value but the thickness of the tablet can vary (8).

3.4.4 Tablet Hardness

Tablets *chewable* It is required to have a higher hardness than ordinary tablets, this is so that the tablets erode slowly in the mouth (19).

Table 11. Chewable Tablet Hardness Test Results

Formula	Hardness (kg)	*p-value*
F1	4.4±0.52	
F2	5.5±0.53	0,007
F3	6.8±0.42	

The results of Table 11 in this study showed that F1-F3 met the tablet hardness test standard, where the tablet hardness value *chewable* Extraction of shallot bulbs (*Allium cepa* L.) has increased. According to the theory, it is explained that the smaller the concentration of the binding material used, the smaller the strength to bind the powder, while the higher the concentration of the binding material used, the hardness of the tablet will also increase, so that in this study for the use of the binding material from F1-F3 there is an increase in the concentration of CMC-Na (the higher the concentration of CMC-Na), which causes the hardness of the tablet from F1-F3 to increase the hardness of the tablet (47).Increasing the concentration of CMC-Na binder results in a higher hardness value, this result is similar to the previous study which stated that an increase in the concentration of CMC-Na increases the hardness value of the tablet because CMC-Na can increase the bonding between particles so that when the granules are compressed into a tablet shape it produces tablets with high hardness during printing so that the tablets have a long time to be crushed (18)(34).

3.4.5 Tablet Fragility

The brittleness test aims to see the strength of the tablet against breakage and erosion (45). Tablet requirements *chewable* Its fragility ranges from 3-4% is still acceptable because tablets *chewable* that have a low level of hardness often results in tablets with a high level of fragility (tablets *chewable* with a low level of hardness tends to have a high level of fragility) (1).

Table 12. Chewable Tablet Fragility Test Results

Formula	Fragility (%)	*p-value*
F1	3.39±0.04	
F2	2.43±0.32	0,000
F3	1.39±0.20	

Table 12 on tablet brittleness testing *chewable* Extraction of shallot bulbs (*Allium cepa* L.) obtained the result that F1-F3 met the brittleness test standards with the resulting data decreasing the brittleness value from F1-F3. The fragility of the tablets can be affected by the strength of the binding material because the strong granules result in hard tablets (23).

The test results showed that the largest percentage of fragility between formulas was found in F1. This is because in F1 the binding material used has the smallest concentration so that the resistance of the tablet to shock is low, in addition to that the fragility of the tablet is related to the hardness of the tablet, which in this study the lowest tablet hardness is at F1, so F1 has the smallest tablet fragility because the hardness level of the tablet is the lowest (47).

The concentration of CMC-Na binder in F1 has the smallest concentration so that it produces a lower hardness value when compared to F2-F3 which has a larger concentration of CMC-Na, this result is similar to the previous study which stated that an increase in CMC-Na concentration increases the hardness value of tablets because CMC-Na can increase the bonds between particles so that when the granules are compressed into tablet form to produce tablets with high hardness (18).

The results of the study can be seen that the hardness is inversely proportional to the fragility of the tablet *chewable* which the lower the hardness of the tablet *chewable* then the higher the fragility and vice versa, the higher the hardness of the tablet *chewable* then the fragility is getting lower (18).

3.4.6 Tablet Disintegration Time

The disintegration time test aims to find out whether the components of the drug contained in the tablets are easily absorbed well in the digestive tract. The condition for the destruction time of a good uncoated tablet is <15 minutes (44).

Table 13. Chewable Tablet Disintegration Time Test Results

Formula	Crush time (minutes)	*p-value*
F1	11.26±0.93	
F2	12.72±0.43	0,007
F3	14.25±0.74	

Based on the test results, it is known that from F1-F3 there is an increase in the crushing time, which can occur because from F1-F3 there is an increase in the concentration of CMC-Na, so that with an increase in the concentration of CMC-Na, it is directly proportional to the increase in the hardness of the tablet and the duration of the crushing time. This is due to the stronger bonds between the particles as the concentration of CMC-Na increases, which results in more compact tablets that take longer to break down (9).

The higher the concentration of CMC-Na binder, the more tablets will be produced *chewable* with longer and longer destruction time (37). This result is similar to previous research which stated that an increase in CMC-Na concentration prolongs the tablet crushing time because CMC-Na causes the pores in the granules to become more compressed and the bonds between the particles to be stronger, resulting in harder tablets and longer tablet crushing time (18)(34).

The results of the study can be found that the hardness and time of tablet destruction *chewable* comparable but inversely proportional to fragility. Tablet hardness *chewable* Proportional to the destruction time, the lower the hardness of the tablet, the faster the tablet destruction time, and vice versa, the higher the hardness of the tablet, the longer the tablet destruction time will be. Hardness and crushing time are inversely proportional to the fragility of the tablet *chewable* which the lower the hardness and the faster the tablet destruction time *chewable* then the higher the fragility and vice versa, the higher the hardness and the longer the tablet breaks down *chewable* then the fragility of the tablet is lower (18)(34).

Another factor that also affects the brittleness value of tablets produced from the three types of formulas is the moisture of the granules, where granules with low moisture have a small cohesive power, resulting in tablets with higher brittleness values (7). Based on the results of the evaluation of the resulting granule moisture, it is known that the lowest granular moisture is produced at F1 so that the fragility value of the tablets produced at F1 is the largest compared to the fragility value produced from F2 and F3.

2.6. Chewable tablet preference test

Table 14. Chewable tablet respondents preference test results

Valuation	Criterion	Likability and responsiveness					
		F1		F2		F3	
		f	%	f	%	f	%
Appearance	Very disliked	0	0	0	0	0	0
	Dislike	10	50	0	0	0	0
	Somewhat dislike	10	50	13	65	6	30
	Like	0	0	7	35	12	60*
	Really like	0	0	0	0	2	10
	Sum	20	100	20	100	20	100
Aroma	Very disliked	0	0	0	0	0	0
	Dislike	13	65	12	60	11	55
	Somewhat dislike	7	35	8	40	9	45
	Like	0	0	0	0	0	0
	Really like	0	0	0	0	0	0
	Sum	20	100	20	100	20	100
Taste	Very disliked	0	0	0	0	0	0
	Dislike	1	5	3	15	4	20
	Somewhat dislike	7	35	6	30	9	45
	Like	13	65*	11	55	7	35
	Really like	0	0	0	0	0	0
	Sum	20	100	20	100	20	100
	Ranking Score	31,67 %		33,70 %		34,62 %	

Information:
F1 = Active substance 66.66% with the addition of CMC-Na 3%
F2 = Active substance 66.66% with the addition of CMC-Na 4%
F3 = Active substance 66.66% with the addition of CMC-Na 5%
f = Panelist frequency
% = Percentage of panelist questionnaire results
* = Highest value

The respondent's preference test was conducted to determine the respondent's preference response to the physical appearance of the tablet *chewable* onion bulbs are acceptable or not. The respondents' preference test was carried out by assessing the appearance, aroma and taste carried out by 20 respondents (32). In this study, panelists were asked to assess each tablet, namely: F1, F2 and F3 with active substances. Panelists were asked to assess the three formulas based on the scores that were already in the questionnaire. Panelists were asked to choose which of the three tablet formulas they liked the most, by writing down a rating of 1 (very disliked), 2 (disliked), 3 (somewhat disliked), 4 (liked) and 5 (very liked) on the questionnaire of liking and sensory responses provided by the researcher (31)(32).

The results of the questionnaire for the assessment of the appearance of the tablets as shown in Table 14 are known that *the chewable tablets of* ethanol extract of onion tubers in F1 for the appearance test have a percentage of 50% who answered that they did not like it and 50% who answered that they did not like it. In F2 for the appearance test, there is a percentage of 65% somewhat dislike and 35% like, while in F3 for the appearance test, there is a percentage of 30% somewhat dislike and 60% like.

Based on these results, it can be seen that the majority of respondents like the appearance of F3 followed by F2, while panelists do not like F1 chewable tablets too much. This is because the binding material (CMC-Na) used in F3 produces tablets that can bind the components of the material used well so that for appearance, namely the color produces a brown color with a round and good tablet shape so that it is preferred compared to F1 which uses less binding material so that the components of the material used are less strongly bound which causes *chewable* tablets in F1 it has a white color with uneven dark brown bitnik and some parts of the tablet are not neat.

In the literature it is explained that color has an important role in the acceptance of a product, ranging from food to medicinal preparations, besides that color is also used as an indicator of whether or not the mixing method or processing method is characterized by the presence of uniform and even colors, so that the color on a product can affect consumer attractiveness and generally consumers prefer more striking colors, In this study, the colors produced from F2 and F3 tablets were light brown to dark brown that were evenly distributed, while in F1 they were white with uneven brown spots (40).

The results of the questionnaire for the assessment of the aroma of the tablets as shown in Table 14 are known that the tablets *chewable* Shallot bulbs in F1 were found that 65% answered that they did not like it and 35% answered that they did not like it a bit. In F2, the panelists answered that they did not like 60% and 40% somewhat disliked, while in F3 respondents answered that 55% did not like and 45% somewhat disliked. Based on these results, it can be seen that the majority of respondents do not like the scent in F1-F3 because the respondents' answers range between dislike and somewhat dislike. The aroma of the tablets was less preferred because it was too shallot-scented and the researchers did not add components that affect the aroma of the tablet preparations *chewable* shallot bulbs are the absence of vanilla additives or other flavorings as *Corrigen Odoris* and *Corrigen Saporis* (20).

Table 14 contains the results of the assessment of the aroma of the tablets for the respondents' preference test that has been carried out, which is intended to be able to find out whether the response to the taste of the *shallot bulb chewable* tablets is acceptable or not. The taste of *chewable tablets* must be considered because of the way the drug is used in *chewable*. The test results showed that in F1 for the aroma test, there was a percentage of 10% who did not like it, 35% who somewhat disliked it and 55% who answered that they liked it. In F2 there is a percentage of 15% dislike, 35% somewhat dislike and 50%, while in F3 for the aroma test has a percentage of 20% dislike, 45% somewhat dislike and 35% who answer yes.

Based on these results, it can be seen that the majority of respondents for the taste assessment of F1 and F2 tablets can be accepted with the percentage of responses that state that tablets *chewable* Shallot bulbs have a sweet taste of >50%, while in F3 <50% who express like. Components that affect the taste of the tablet *chewable* are mannitol as a filler that has a sweet taste and leaves a cold sensation in the mouth, and sucrose as a filler that has a sweet taste (24).

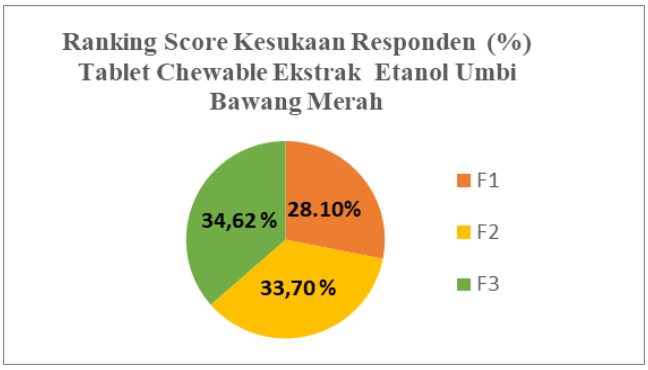

Figure 1. Graph of chewable tablet respondent preference test

The results of the assessment of the respondents' preference test are as shown in Figure 1. It is known that in 20 respondents after testing chewable tablets of ethanol extract of shallots, shallots, for the criteria of appearance, aroma and taste, the results were obtained that the most preferred tablet with rank 1 was F3 which had a preference percentage of 20 respondents of 34.62%. In rank 2 which has a percentage of preference from 20 respondents of 33.70% and the last rank is F1 with a percentage of preference from 20 respondents of 34.62%.

3 Conclusion

Based on the results of the research on the formulation *of chewable* tablets of ethanol extract of onion tubers (*Allium cepa* L.) It can be concluded as follows variations in CMC-Na concentration as a binding agent had an effect on the print mass of *chewable tablets of ethanol* extract of onion tubers (*Allium cepa* L.) with *a p-value* of <0.05. Variations in CMC-Na concentration as a binding agent had an effect on the physical properties of *chewable tablet preparations of ethanol* extract of onion tubers (*Allium cepa* L.) with *a p-value* of <0.05. Variations in the concentration of CMC-Na as a binding agent cause differences in preferences for appearance and taste. The appearance is more preferred if the CMC-Na is increasing, while for the taste if the CMC-Na is getting less, the taste will be preferred.

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