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FORMULATIONS AND EVALUATIONS OF PHYSICAL QUALITY OF CROSCARMELLOSE SODIUM AS A DESINTEGRATOR OF KETOPROFEN TABLETS

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ABSTRACT

The use of disintegrating agents in a tablet formulation is used to speed up the disintegration time thereby influencing the release of the active ingredient (Ketoprofen) from the initial dosage form (tablet) which influences the start of the drug's action in the body. Croscarmellose sodium has characteristics that fulfill its properties as a disintegrating agent. The aim of this research is to determine the effective concentration of Croscarmellose sodium as a disintegrating agent using three test group formulations, namely 1st Formulation which uses 1% Croscarmellose sodium, 2nd Formulation which uses 3% Croscarmellose sodium, 3rdFormulation which uses 5% Croscarmellose sodium with a comparison 4th formulation as a negative control without using Croscarmellose sodium and Ketoprofen tablets which have been widely circulated in the community as one of the analgesic, antipyretic and anti-inflammatory drug choices used as positive controls. The method used in this research is experimental. The results of the research show that variations in the concentration of disintegrating agents have a different influence on the physical quality of the tablets produced, based on the results of the Oneway Anova test analysis, it shows a significant value of 0.000 ($p<0.05$) and the Kruskal-Wallis shows a significant value of 0.10 ($p >0.05$). In testing the physical quality of tablets which was carried out based on the requirements set by the Indonesian Pharmacopoeia, the best results were obtained in Formula 1 which used Croscarmellose sodium 1%, with a tablet hardness value of 5.65 kg and a disintegration time value of 8.45 minutes which was close to the positive control results with values tablet hardness 10.23 kg and disintegration time value 7.57 minutes.

Keywords: croscarmellose sodium; disintegration time; ketoprofen

BACKGROUND

The development of disintegrants for tablet formulation in the form of disintegrants, one example of a disintegrant is the disintegrant Croscarmellose sodium, which is known as a superdisintegrant, which is very popular because its use in relatively low concentrations (2-4%) can break down tablets. Croscarmellose sodium or also called Accelerate Disolution (Ac–Di–Sol) is one of the disintegrants which is cross-linked CMC Na (Setyawan et al., 2010). Croscarmellose sodium has two working mechanisms, namely fast water absorption (water wicking) and rapid and large swelling (rapid swelling). Croscarmellose sodium also has good dissolution and disintegration characteristics, thereby increasing the disintegration time of the bioavailability of the tablet formula (Garnadi, 2019).

METHODS

This research is an experimental laboratory research which includes the sample preparation stage, which starts from making granules to then be molded into Ibuprofen tablet preparations with the disintegrating agent Croscarmellose Sodium using the wet granulation method and tablet evaluation tests which include tablet hardness tests, weight uniformity, tablet friability, dissolution. and time is destroyed. The independent variable in this study is the concentration of the destroying agent Croscarmellose Sodium, namely 1%, 3% and 5%. The dependent variable in this research is the examination of the physical properties of the granules including flow time and angle of repose, examination of the physical properties of the tablets including the weight uniformity test, tablet hardness test, tablet friability test, disintegration time test and dissolution test. The controlled variables in this research are making porang tuber starch, making tablets, and analyzing the disintegration and dissolution times of tablets.

RESULTS

1. The use of the disintegrating agent Croscarmellose Sodium with varying concentrations of 1%, 3% and 5% has a different influence on the physical quality evaluation of Ketoprofen tablets produced in weight uniformity, tablet hardness, tablet friability and disintegration time evaluation tests.
2. Croscarmellose sodium concentration of 1% formulation 1st is the selected formula with physical quality that meets the tablet requirements and has a test value that is close to the test value range of the positive control (+) Ketoprofen 100mgs® with a tablet hardness evaluation value of 5.65 kgs and a time evaluation value disintegrated in 8.45 minutes which was almost close to the positive control (+) Ketoprofen 100mg® which had a hardness evaluation value of 10.23 kgs and a disintegration time evaluation value of 6 minutes.

Table 1. Tablet physical quality test

Evaluations	Formulations				
	FIst	F2nd	F3rd	Controls(-)	Controls(+)
Weight Uniformities (mgs)	152,13±1,37	156,33±0,30	159,12±2,46	153,33±1,08	152,67±2,65
Hardness (kgs)	5,65 ± 0,04	6,51 ± 1,34	4,72 ± 3,67	4,78 ± 3,14	10,23 ±1,37
Fragilities (%)	0,81 ± 1,09	0,78 ± 2,05	0,65 ± 1,28	0,91 ± 1,19	0,20 ± 0,15
Desintegration Times (menits)	8,45 ± 0,71	6,51 ± 0,71	4,64 ± 0,76	12,71±1,01	7,57± 0,87

The weight deviation from the average weight should not be more than 2 tablets with a weight deviation of more than 5% and no single tablet with a deviation greater than 10% (Hayatus Sa`adah, 2019). The tablet friability test requirement is no more than 0.8% – 1% (Rustiani, 2019). The table shows that formulation 3rd does not meet the requirements of the tablet friability test. Tablet hardness test requirements are between 4 – 8 kg (Rustiani, 2019). The table shows that the K(-) formulation (without crusher) does not meet the tablet hardness test requirements. The tablet disintegration time test requirement is no more than 15 minutes for uncoated tablets (Rustiani, 2019). The table shows that formulations 1st, formulations 2nd, formulations 3rd, negatif controls (-) and positive controls (+) meet the requirements of the tablet disintegration time test.

DISCUSSION

Tablet formulations are made with different variations of the Croscarmellose Sodium disintegrating agent used in each formulations, for formulations 1st with consentrations Croscarmellose Sodium 1%, formulations 2nd with consentrations Croscarmellose Sodium 3% , formulations 3rd with consentrations Croscarmellose Sodium 5%. Tablet formulations as a negative control (K-) without using disintegrants and a positive control (K+) using generic Ketoprofen® 100 mg tablets on the market and tablets are made using the wet granulation methods. ANOVA test analysis produced a significant value of 0.000 ($p<0.05$), which means there is a significant difference in the tablet friability of each formulation. Then continued with the post hoc test, the results of the post hoc test showed that there were differences between formulations 1st and formulations 3rd, and so between formulations 2nd and formulations 3rd, positive controls (+) with formulations 1st, negative controls (-) with formulations 2nd. It can be concluded that differences in the concentration of the disintegrating agent used can have a different effect on the fragility of the tablets produced (Umrona, 2020). It can be seen from these results that all formulations meet the disintegration time test requirements, namely not more than 15 minutes (Garnadi, 2019). The results of the one way ANOVA statistical test are because the homogeneity value is <0.05, so it cannot be done with the one way ANOVA test. The results of the Kruskal-Wallis test obtained a significant value of <0.05, where it can be said that there are differences in each formulation. So it can be concluded that differences in the concentration of the disintegrating agent can affect the disintegration time, the higher the concentration of the disintegrating agent, the faster the tablet will disintegrate.

CONCLUSION

The use of the disintegrating agent Croscarmellose Sodium with varying concentrations of 1%, 3% and 5% has a different influence on the physical quality evaluation of Ketoprofen tablets produced in weight uniformity, tablet hardness, tablet friability and disintegration time evaluation tests. Croscarmellose sodium concentration of 1% formulations 1st is the selected formula with physical quality that meets the tablest requirements and has a test value that is close to the test value range of the positive controls (+) Ketoprofen 100mg® with a tablet hardness evaluations value of 5.65 kgs and a time evaluations value disintegrated in 8.45 minutes which was almost close to the positive controls (+) Ketoprofen 100mg® which had a hardness evaluations value of 10.23 kgs and a disintegration time evaluations value of 6 minutes.

Further research is needed by carrying out in vitro and in vivo assay tests on the wider use of Crosscarmellose Sodium in tablet preparations as a tablet disintegrating agent.

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