Biospectra : Vol. 12(1A), March, 2017, Spl. Issue, pp. 267-270
An International Biannual Refereed Journal of Life Sciences

ISSN : 0973-7057

EFFECT OF CARBOXYMETHYLATION ON THE MICROMERITIC PROPERTIES OF GRANULES PREPARED FROM CUCUMISMELO.L SEEDS

Jayaram kumar K.*, Panpalia S. G.,Santosh Kumar G.
Department of Pharmaceutical Sciences and Technology, Birla Institute of Technology,
Mesra, Ranchi, Jharkhand, India.

Abstract : Starch was isolated from seeds ofCucumis melo. L and further carboxymethylated starches was prepared by using monochloro acetic acid. The granules were prepared by wet granulation method by using different concentrations of native and carboxymethylation. The micrometric properties of the granules like bulk density, tapped density, Hausner ratio, Carr's index and angle repose were determined. The micrometric properties revealed that compressibility and flowability of granules improved after carboxymethylation, suggesting its use in formulation of tablets.

Keywords:

INTRODUCTION

In view of environmental pollution, usage of synthetic polymers has assumed to be dangerous. Many of the petroleum-derived products are not easily bio-degradable and are resistant to microbial degradation. There may be chance of accumulation in environment which leads to toxicity. In this context, usage of bio-degradable polymers is gaining interest now-a-days(R. Chamy &F. Rosenkranz) Nowadays many tailored methods that are presently studied upon the polysaccharide based microsphere as the drug carriers, with 80% drug loading capacity (Bhattacharya, Ghosh, Banerjee, Chattopadhyay & Ghosh, 2012).The starch have various pharmaceutical applications as they are used as emulsifiers, diluents, binders, colloidal agents, in the preparation of suppositories, suspending agent, gelling agents, thickening agents(Nowkocha&williams, 2014). There is an increase in the use of the plant polysaccharide in the pharmaceutical industry as they tend to be safer than the synthetic polymers. They exhibit less toxicity. There is an increase in the use of the plant polysaccharide in the pharmaceutical industry as they tend to be safer than the synthetic polymers.

*Corresponding author :
Phone: 0
E-mail : jayarampharm@gmail.com

Cucumismelo.Lbelongs to cucurbitaceae family. It is the tropical plant that is found in temperate, tropical and sub-tropical countries (Mansouri, Mirzake, & Ráufi, 2015). It is a small deciduous plant that hasshown, anti-inflammatory and anti-oxidative(Petkova & Antova, 2015).

MATERIALS AND METHODS

Cucumis melo.L seeds purchased from local market of Hyderabad, south region of India. All chemicals procured from central drug house, Mumbai, India.

Isolation starch

About 200 g of seeds was taken and washed properly with water. Starch was isolated using the procedure followed by (Tijsen, Kolk, Stamhuis, & Beenackers, 2001) Seeds were defatted with petroleum ether. The obtained slurry were soaked in 1.5% w/v of NaOH acid solution in order to separate starch from mucilage and proteins and were ground by blender. Obtained starch suspension was washed continuously with water until the supernatant got clear. Then it was kept aside to settle down, and supernatant water was decanted. Final wet starch was allowed to dry for 72 h. in a temperature controlled oven. Thus the obtained dehydrated starch was packed in polythene bag and kept in a desiccator. The ratio of final dried weight of starch to the initial weight of seeds gives the percentage yield.

Preparation of granules

The granules were prepared by wet granulation method using isolated starch. Granules were then assessed for their micromeritic properties(Paramakrishnan, Jha, & Jayaram Kumar, 2015).

Table 1 Ingredients used for the preparation of granules

Ingredients	Quantity/Tablet (%w/w)
Paracetamol	66.66
Lactose	14.34
Starch	8.00
Gum acacia	10.00
Talc	0.50
Magnesium Stearate	0.50

Micromeritic properties

Bulk density and tapped density

bulk density determined by the according to the method followed by the (Das, Jha, & Jayaram Kumar, 2014) with slight modification . In a 10 ml measuring cylinder, granules was taken which was the initial weight (Wi) and the volume occupied (Vi) was noted. The final volume of the granules (Vf) was noted after the 100 tapings of the measuring cylinder. The ratio of the initial weight (Wi) of the granules to that of the occupied volume (Vi) and tapped volume (Vf), correspondingly provided the bulk and tapped density values.

True Density

Using the liquid displacement method True Density (Td) was estimated and computed as per the given formula.(Sutradhar, Akhter, & Uddin, 2012)

$$Td = \frac{Wps}{[a + Wsp) - b] \times SG} \quad \text{(i)}$$

Where Wp is the weight of sample, "a" is the total added weight of bottle plus solvent, "b" is the weight of bottle with the total of solvent and sample .SG denotes the specific gravity of solvent.

Flow Properties

The Hausner ratio and Carr's Index are the two initial parameters to measure the granules flow properties. Hausner ratio and Carr's Index determined and computed using formulae,(Kumar Varma, Panpalia, & Kumar, 2014)

$$HR = \frac{tapped}{bulk} \quad \text{(ii)}$$

$$CI = \frac{tapped - bulk}{tapped} \times 100 \quad \text{(iii)}$$

Angle of repose

The use of the funnel and cone was done as defined by (Kumar et. al., 2014) for defining the flow property granules. A sample of granules was passed through a funnel on a blank paper until the peak of the cone just touches the tip of the funnel. The mean elevation of granules sample heap (h) and mean diameter (d) of the base was determined. Angle of repose was calculated by employing:

$$= \tan^{-1}\left(\frac{h}{r}\right) \quad \text{(iv)}$$

Table 4: Powder characteristics of native and carboxymethylated starches of Cucumis melo L. seeds

Samples	Bulk density (g/ml)	Tapped density (g/ml)	True density (g/ml)	Hausner ratio	Carr's index (%)	Angle of repose (^{o})
Native (4%)	0.73±0.15	0.89±0.12	0.625±0.56	1.21±0.16	17.97±0.16	32.92±0.26
Native (8%)	0.76±0.23	0.90±0.25	0.685±0.54	1.18±0.16	15.55±0.56	31.26±0.87
CMS-1 (4%)	0.73±0.24	0.86±0.29	0.365±0.25	1.18±0.19	15.31±0.31	29.52±0.25
CMS-1 (8%)	0.85±0.56	0.95±0.65	0.395±0.65	1.11±0.29	10.52±0.62	28.65±0.69
CMS-2 (4%)	0.65±0.32	0.74±0.26	0.382±0.15	1.13±0.26	12.16±0.19	27.35±0.85
CMS-2 (8%)	0.72±0.53	0.80±0.65	0.395±0.47	1.11±0.45	10.01±0.26	25.95±0.26
CMS-3 (4%)	0.69±0.25	0.79±0.18	0.386±0.16	1.14±0.02	12.65±0.85	28.46±0.29
CMS-3 (8%)	0.67±0.14	0.74±0.36	0.397±0.26	1.10±0.26	9.45±0.26	26.23±0.58

All values represent the means of triplicate analysis ± standard deviation.

Micromeritic and tablet properties are being exemplified in the table. The results expose that bulk density, tapped density of the granules lessened with the escalation of the concentration of starch. Carr's index was within the values conveyed in the literature (e.g. Carr's index <10 excellent, 11-15 good, 16-20 fair, 21-25 able to pass and >25 reduced flow) (USP, 241 2008). Carboxymethylated starches has better Carr's index and Hausner ratio compared to the native starch.

CONCLUSION

The granules prepared from carboxymethylated starches found to have good to excellent compressibility compared to that of native starch. After carboxymethylation, there was an improved flowability of granules with increase in the concentration of carboxymethylated starch. Hence, carboxymethylated starches can be used for the formulation of tablets.

REFERENCES

Bhattacharya, S. S., Ghosh, A. K., Banerjee, S., Chattopadhyay, P., & Ghosh, A.(2012),Al3+ ion cross-linked interpenetrating polymeric network micro beads from Tailored natural polysaccharides,Journal of Ethno pharmacology,12-20.

Das, D., Jha, S.& Jayaram Kumar, K. (2014). Isolation and release characteristics of starch

fromrhizome of Indian Palo. International Journal of Biological Macromolecules, 72, 341-346.

Kumar Varma, C. A., Panpalia, S. G., & Kumar, K. J. (2014). Physicochemical and release kinetics of natural and retrograded starch of Indian palmyrah shoots. International Journal of Biological Macromolecules, 66, 33-39.

Mansouri, A., Mirzake, A. H., & Ráufi, A. (2015). Physical properties and mathematical modeling of melon (Cucumis melo L.) seeds and kernels. Journal of the Saudi Society of Agricultural Sciences.

Nowkocha, L. M. &Williams, P. A. (2014)Isolation and characterization of a novel polysaccharide from seeds of Peltophorum pterocarpum, Food Hydrocolloids, 319-324.

Paramakrishnan, N., Jha, S., & Jayaram Kumar, K. (2015). Characterization and evaluation of smart starch from Kyllinga nemoralis. International Journal of Biological Macromolecules, 72(C), 1020-1026.

Petkova, Z., & Antova, G. (2015). Proximate composition of seeds and seed oils from melon (Cucumis melo L .) cultivated in Bulgaria. Cogent Food & Agriculture, 9(1), 1-15.

R. Chamy &F. Rosenkranz, Biodegradation - Life of Science, 2013.

Sutradhar, K. B., Akhter, D. T., & Uddin, R. (2012). Formulation and evaluation of taste masked oral dispersible tablets of Domperidone using sublimation method. International Journal of Pharmacy and Pharmaceutical Sciences, 4(2), 727-732.

Tijsen, C. J., Kolk, H. J., Stamhuis, E. J., & Beenackers, A. A. C. M. (2001). An experimental study on the carboxymethylation of granular potato starch in non-aqueous media. Carbohydrate Polymers, 45(3), 219-226.