Journal of Applied Pharmaceutical Science

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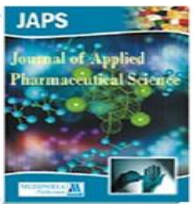

ISSN: 2231-3354
Received: 03-06-2011
Revised on: 06-06-2011
Accepted: 08-06-2011

Formulation and evaluation of fast dissolving tablets of Granisetron hydrochloride by vacuum drying technique

Basawaraj S.Patil and N.G.Raghavendra Rao

ABSTRACT

The purpose of this investigation was to develop fast dissolving tablets (FDTs) of Granisetron hydrochloride (GHCl) by vacuum drying technique using camphor as subliming agent together with croscarmellose sodium (CCS), crospovidone (CP), sodium starch glycolate (SSG) and *plantago ovate* (PO) as superdisintegrants. The prepared formulations were evaluated for pre-compressional and post-compressional parameters. The compatibility of drug with other ingredients was checked by FTIR studies, the results revealed that there was no interaction between dug and other excipients. The values of pre-compressional parameters were within prescribed limits and indicated good free flowing properties. In all the formulations the hardness test indicates good mechanical strength. Friability of all formulations was less than 1. Drug content was found to be high (≥ 100.44%) and uniform in all the formulations. The tablet thickness was found to be 3.11 – 3.34. The weight variation results revealed that average percentage deviation was less then ± 7.5 %, which provides good uniformity in all formulations. The disintegration time of the tablets found to be in the range of 18 to 44 sec. The formulations SBC_4, SBP_4, SBG_4, and SBO_4 50 % of drug released in 0.41, 0.48, 0.59 and 0.47 min, and 90 % of drug released in 2.01, 3.05, 4.01 and 2.51min. Stability study carried out as per ICH guidelines for three months and results revealed that upon storage disintegration time of tablets decreased significantly ($p<0.05$). The release of drug from the SBC_4 and SBO_4 formulations was quick when compared to other formulations. It was concluded that fast dissolving tablets with improved Granisetron hydrochloride dissolution could be prepared by sublimation of tablets containing suitable subliming agent.

Key words: Fast dissolving tablet, Granisetron hydrochloride, Subliming agent, super disintegrant, Camphor.

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INTRODUCTION

Granisetron hydrochloride (Fig.1) is chemically endo-1-methyl-N- (9-methyl-9-azabicyclo [3.3.1] non-3-yl)-H-indazole-3-carboxamide hydrochloride, a selective 5-HT_3 receptor antagonist, which may have beneficial therapeutic effects in the treatment of vomiting and nausea resulting from cancer therapy (Sanger et al, 1989; Carmichael et al, 1989; Upward et al, 1990). It has an improved side effect and tolerabilility profile, a lower risk of drug interactions and a longer duration of action than other 5-HT_3 receptor antagonists. It is also an effective and well-tolerated agent in the management of chemotherapy-induced, radiotherapy-induced and post-operative nausea and vomiting in adults and children (Aapro 2004;Yunyun Jiang et al., 2006). Its main effect is to reduce the activity of the vagus nerve, which is a nerve that activates the vomiting center in the medulla oblongata. Granisetron hydrochloride undergoes extensive hepatic first pass metabolism with a bioavailability of 60%. The terminal elimination half-life is 3 to14 hours after oral administration. Granisetron hydrochloride is about 65% bound to plasma proteins (Source: www.wikipedia.org.). The tablet is the most widely used dosage form because of its convenience

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in terms of self-administration, compactness, and ease in manufacturing. However, geriatric and pediatric patients experience difficulty in swallowing conventional tablets, which leads to poor patient compliance. To overcome this weakness, scientists have developed innovative drug delivery systems known as fast dissolving tablets.

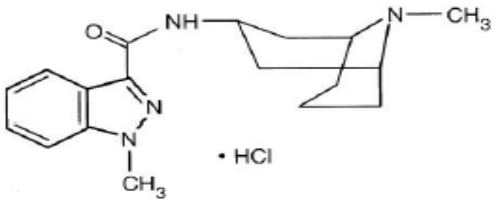

Fig. 1. Structure of Granisetron hydrochloride

Their characteristic advantages such as administration without water, anywhere, any time lead to their suitability to geriatric and pediatric patients. They are also suitable for the mentally ill, the bedridden and patients who do not have easy access to water. The benefits, in terms of patient compliance, rapid onset of action, increased bioavailability, and good stability make these tablets popular as a dosage form of choice in the current market (Bi et al, 1996; Chang et al, 2000). The fundamental principle used in the development of the fast-dissolving tablet is to maximize its pore structure. Researchers have evaluated spray dried materials (Mishra et al, 2006) and plastic materials (Fu et al, 2005) for development of such tablets. Vacuum-drying (Gohel et al, 2004; Omaima et al, 2006) and freeze-drying (Corveleyn et al, 1997; Ahmed et al, 2006; Ahmed et al, 2007; Suresh et al, 2007) techniques have been tried by researchers to maximize the pore structure of tablet matrix. Freeze drying is cumbersome and yields a fragile and hygroscopic product. Therefore, a vacuum drying technique was adopted in the present investigation after addition of a subliming agent to increase porosity of the tablets. It is likely that a porous hydrophilic matrix will easily pick up the disintegrating medium and break quickly.

In the present study, an attempt was made to develop dissolving tablets of Granisetron hydrochloride and to investigate the effect of subliming agent on the release profile of the drug in the tablets.

MATERIALS AND METHODS

Granisetron hydrochloride was gift sample from Natco Pharma. Ltd. Hyderabad. (AP - India). Seeds of *plantago ovata* were purchased from local market of Gulbarga, Karnataka, India. Croscarmellose sodium, crospovidone, sodium starch glycolate camphor, aspartame, mannitol, talc, magnesium stearate, and all the other chemicals used were of pharmaceutical grade.

Isolation of Mucilage

The seeds of *plantago ovate* were soaked in distilled water for 48 h and then boiled for few minutes so that mucilage was completely released into water (Washi, 1985). The material collected was squeezed through muslin cloth for filtering and separating out the marc. Then, an equal volume of acetone was added to the filterate so as to precipitate the mucilage. The separated mucilage was dried (in oven at temperature less than 60^0 C), powdered, sieved (# 80) and stored in a desicator until use.

Fourier transform infrared (FTIR) spectroscopy

The Fourier-transform infrared spectra of Granisetron hydrochloride and mixture Granisetron hydrochloride with other excipients were obtained by using FTIR spectroscopy – 5300 (JASCO Japan). Samples were prepared by KBr pressed pellet technique. The scanning range was 400 -4600 cm^{-1} and the resolution was 4 cm^{-1}. The spectra are shown in Fig. 2.

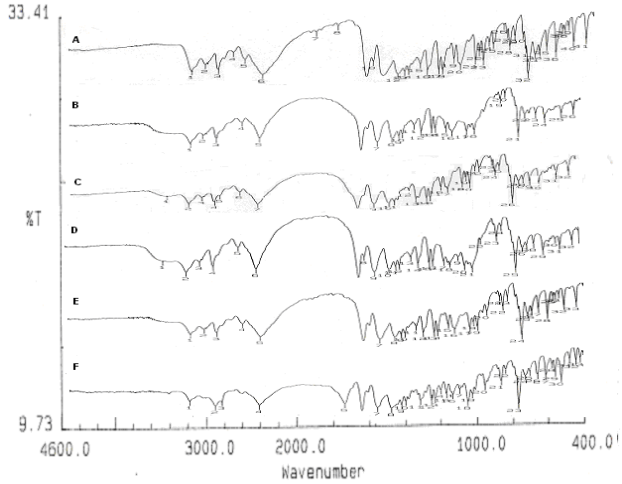

Fig. 2. IR spectrum of Granisetron hydrochloride (A), Drug+CCS,(B), Drug+CP,(C), Drug+SSG,(D), Drug+PO,(E), Drug+Camphor(F)

Preparation of tablet

Granisetron hydrochloride 2.4 mg was taken and mixed with mannitol, directly compressible microcrystalline cellulose, super disintegrant, aspartame and camphor, (10%) in plastic container. Magnesium strearate and talc were passed through sieve No. 60 and blended with initial mixture in the plastic container followed by direct compression of blend (Table 1). After compression the tablets were collected and vacuum dried at 60^0C until the constant weight is obtained to ensure the complete removal of sublimable component to make a tablet porous.

Evaluation of tablets

Tablet was evaluated for hardness, friability, weight variation, thickness, disintegration time, wetting time, water absorption ratio, drug content and stability study. The Pfizer hardness tester and roche friabilator were used to test hardness and friability loss respectively. In weight variation test, 20 tablets were selected at random and average weight was determined using electronic balance. Tablets were weighed individually and compared with average weight. Disintegration time was determined using USP Tablet disintegration test apparatus using

Table 1: Formulation of Granisetron hydrochloride FDTs.

Formulation Code	Ingredients												
	GHCl	CCS	CP	SSG	PO	Mannitol	MCC	Camphor	Aerosil	Aspartame	MS*	Talc	Total wt (mg)
SBC_1	2.4	2.5	--	--	--	69.10	10	10	1	3	1	1	100
SBC_2	2.4	5	--	--	--	66.60	10	10	1	3	1	1	100
SBC_3	2.4	7.5	--	--	--	64.10	10	10	1	3	1	1	100
SBC_4	2.4	10	--	--	--	61.60	10	10	1	3	1	1	100
SBP_1	2.4	--	2.5	--	--	69.10	10	10	1	3	1	1	100
SBP_2	2.4	--	5	--	--	66.60	10	10	1	3	1	1	100
SBP_3	2.4	--	7.5	--	--	64.10	10	10	1	3	1	1	100
SBP_4	2.4	--	10	--	--	61.60	10	10	1	3	1	1	100
SBG_1	2.4	--	--	2.5	--	69.10	10	10	1	3	1	1	100
SBG_2	2.4	--	--	5	--	66.60	10	10	1	3	1	1	100
SBG_3	2.4	--	--	7.5	--	64.10	10	10	1	3	1	1	100
SBG_4	2.4	--	--	10	--	61.60	10	10	1	3	1	1	100
SBO_1	2.4	--	--	--	2.5	69.10	10	10	1	3	1	1	100
SBO_2	2.4	--	--	--	5	66.60	10	10	1	3	1	1	100
SBO_3	2.4	--	--	--	7.5	64.10	10	10	1	3	1	1	100
SBO_4	2.4	--	--	--	10	61.60	10	10	1	3	1	1	100

* MS: Magnesium stearate

Table 2: Precompressional parameters of Granisetron hydrochloride FDTs

Formulation code	Angle of repose* (degree) ±SD	Bulk density* (g/cc) ± SD	Tapped density* (g/cc) ± SD	Carr's index* (%) ± SD	Hausner's Ratio* ± SD
SBC_1	25.43 ± 0.61	0.42 ± 0.01	0.52 ± 0.01	14.77 ± 1.49	1.17 ± 0.03
SBC_2	24.19 ± 1.23	0.41± 0.01	0.48 ± 0.01	14.04 ± 1.11	1.16 ± 0.02
SBC_3	23.20 ± 1.11	0.40 ± 0.01	0.48 ± 0.01	14.67 ± 0.63	1.17 ± 0.04
SBC_4	25.36 ± 1.07	0.43 ± 0.03	0.50 ± 0.01	14.30 ± 0.01	1.16 ± 0.01
SBP_1	24.17 ± 0.47	0.41 ± 0.01	0.48 ± 0.02	14.02 ± 0.55	1.16 ± 0.01
SBP_2	23.08 ± 0.12	0.42 ± 0.01	0.49 ± 0.01	14.79 ± 0.61	1.17 ± 0.02
SBP_3	25.19 ± 0.32	0.40 ± 0.01	0.48 ± 0.01	15.10 ± 1.03	1.17 ± 0.01
SBP_4	25.31 ± 0.26	0.43 ± 0.04	0.51 ± 0.01	15.73 ± 0.26	1.18 ± 0.02
SBG_1	23.27 ± 0.24	0.45 ± 0.01	0.52 ± 0.01	13.52 ± 1.16	1.15 ± 0.01
SBG_2	26.20 ± 0.59	0.44 ± 0.01	0.51 ± 0.01	13.36 ± 0.42	1.15 ± 0.04
SBG_3	25.14 ± 0.18	0.42 ± 0.07	0.49 ± 0.02	13.84 ± 1.37	1.16 ± 0.02
SBG_4	26.18 ± 1.57	0.41 ± 0.01	0.48 ± 0.01	14.59 ± 1.10	1.17 ± 0.01
SBO_1	26.48 ± 1.16	0.41 ± 0.07	0.48 ± 0.01	14.71 ± 1.22	1.17 ± 0.01
SBO_2	25.21 ± 1.10	0.40 ± 0.07	0.48 ± 0.01	15.78 ± 1.12	1.18 ± 0.02
SBO_3	25.25 ± 0.17	0.43 ± 0.01	0.50 ± 0.01	14.28 ± 0.31	1.16 ± 0.01
SBO_4	24.51 ± 0.24	0.44 ± 0.01	0.51 ± 0.01	13.86 ± 1.16	1.16 ± 0.04

* Average of three determinations

900 ml distilled water at room temperature. Thickness of tablets was determined by using dial caliper, wetting time study, a piece of tissue paper folded twice was kept in culture dish containing 6 ml of distilled water. A tablet having small amount of amaranth powder on upper surface was kept on tissue paper. A time required to develop a red color on upper surface of tablet was recorded as the wetting time. For drug content analysis, a total 10 tablets were weighed and powdered. The powder equivalent to 2.4 mg of Granisetron hydrochloride was taken and dissolved in phosphate buffer 6.8. After that an aliquot of the filtrate was diluted and analyzed spectrophotometrically at 302 nm. Using 900 ml of buffer monitored *in vitro* dissolution of Granisetron hydrochloride from tablets at 37 ± 0.5^0C at 50 rpm using programmable dissolution tester. Aliquots were withdrawn at 1 min time intervals. Aliquots, following suitable dilution were assayed spectrophotometrically at 302 nm. The stability study of the tablets were carried out according to ICH guidelines by storing tablets in stability chamber at 40 ± 2^0C / 75 ± 5% RH for 3 months.

RESULTS AND DISCUSSION

FTIR studies revealed that there was no physico-chemical interaction between Granisetron hydrochloride and other excipients. IR spectra of pure drug Granisetron hydrochloride show characteristic absorption peak at 3082 cm^{-1}. This is due to C-H vibrations, indicating that this molecule contains aromatic residue. In addition to this it also exhibited a peak at 2939 cm^{-1} due to C-H of the aliphatic bond of the molecule. The C=C absorption peaks are notice that 1647 cm^{-1} and 1612 cm^{-1} this is the characteristic area were in C=C absorption are appearing in the IR spectrum of this compound suggest that molecule and investigation contains aromatic moiety along with aliphatic residue, also it contains more than one double bond in the molecule. These characteristic peaks are present in IR scan of all formulations, so it confirms that, presence of undisturbed drug in the formulations. Hence there are no drug-excipient interactions. The flow properties of the powder mixture are important for the uniformity of mass of tablets; the flow of powder mixture was before compression of tablets. The

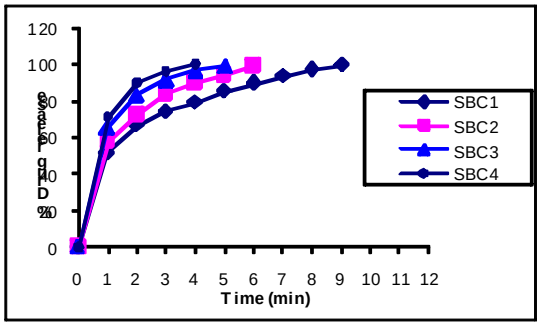

Fig. 3: Dissolution profile of formulations SBC_1-SBC_4

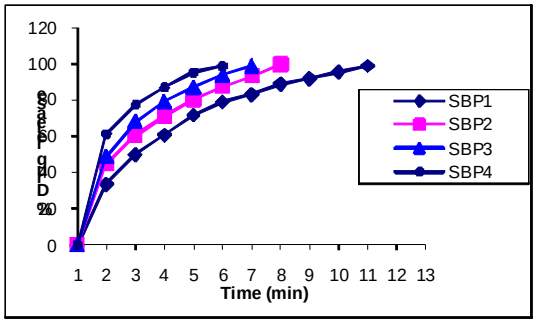

Fig. 4: Dissolution profile of formulations SBP_1-SBP_4

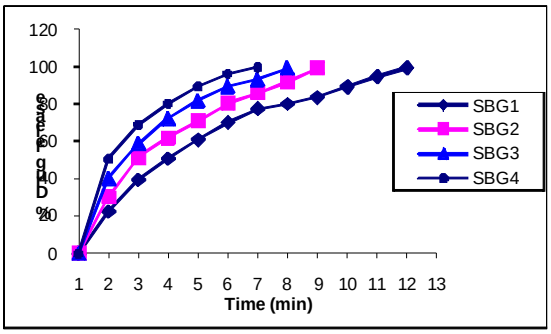

Fig. 5: Dissolution profile of formulations SBG_1-SBG_4

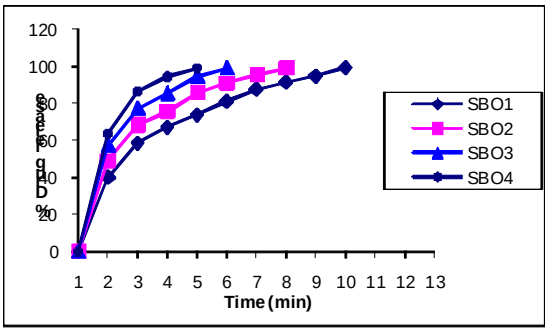

Fig. 6: Dissolution profile of formulations SBO_1-SBO_4

values of pre-compressional parameters were within prescribed limit as per USP XXVII and indicate good flow properties. The results are shown in table 2. The post compressional parameters results are shown in table 3 and 4. In all the formulations the hardness test indicate good mechanical strength. The hardness of all tablets found between 2.4 to 3.0 kg/cm^2. Friability of all formulation was less than 1%, which indicates the tablets had good mechanical resistance. Drug content was found to be high (≥100.44 %) and uniform in all formulations. The tablet thickness was found to be 3.11 to 3.34 mm. The weight variation results revealed that average percentage deviation of 20 tablets of each formula was less than ± 7.5%, which provide good uniformity in all formulations. The disintegration time of all tablets found to be in the range of 18 to 44 sec. The tablets prepared by vacuum drying technique rapidly exhibit high pores and disintegrate the tablets rapidly. It may be due to their lowest hardness and maximum pore structure was responsible for faster water uptake; hence it facilitates wicking action of superdisintegrants in bringing about faster disintegration. Wetting time is closely related to the inner structure of the tablet. The wetting time of all formulations were found to be in the range of 36 to 50 sec. The dissolution profiles of all formulations are shown in Fig. 3 to 6. Out of sixteen formulations, the formulations SBC_4 and SBO_4 show faster drug release within 4 min. *In vitro* profile of Granisetron hydrochloride shown in Fig. 7 and in Table 5. The $t_{50\%}$ and $t_{90\%}$ values changed with changing concentration of superdisintegrants. The formulations SBC_4, SBP_4, SBG_4, and SBO_4 50 % of drug released in 0.41, 0.48, 0.59 and 0.47 min, and 90 % of drug released in 2.01, 3.05, 4.01 and 2.51min.

The stability studies results revealed that, the disintegration time, wetting time was decreased significantly (Table 6). During the sublimation procedure all the formulations were kept in vacuum dryer at 45^{0}C for 60 min. at this time sum amount of subliming agent may be left in the formulations after vacuum drying. But in case of stability study, the selected formulations were kept at 40^{0}C for 90 days. This extended expose time may leads to evaporation of subliming agent, which may left after sublimation techniques leads to increased formation of pores in the tablets. So, the disintegration and wetting time of tablets were decreased after stability study.

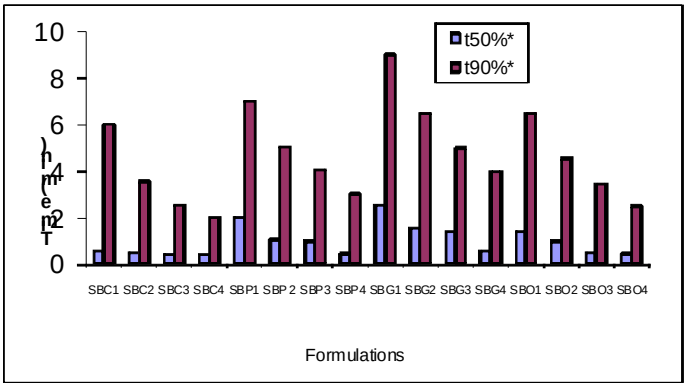

Fig. 7: Comparison of release profile ($t_{50\%}$ and $t_{90\%}$)of different formulations

Conclusion

The release of drug from the SBC_4 and SBO_4 formulations was quick when compare to other formulations. It can be

Table 3: Post-compressional parameters of Granisetron hydrochloride FDTs.

Formulation Code	Hardness* (Kg/cm^2) ± SD	Thickness* (mm) ± SD	Friability (%)	Weight variation* (mg) ± SD
SBC_1	2.5 ± 0.11	3.10 ± 0.12	0.61	99 ± 0.72
SBC_2	3.0 ± 0.01	3.15 ± 0.15	0.53	98 ± 0.04
SBC_3	2.7 ± 0.12	3.13 ± 0.10	0.51	99 ± 0.53
SBC_4	2.6 ± 0.15	3.21± 0.10	0.57	101 ± 0.29
SBP_1	2.8 ± 0.30	3.14 ± 0.14	0.64	100 ± 0.64
SBP_2	2.9 ± 0.21	3.17 ± 0.17	0.58	101 ± 0.18
SBP_3	2.6 ± 0.37	3.16 ± 0.05	0.45	100 ± 0.82
SBP_4	2.4 ± 0.07	3.11 ± 0.16	0.59	99 ± 0.39
SBG_1	2.5 ± 0.28	3.30 ± 0.20	0.43	102 ± 0.10
SBG_2	2.4 ± 0.12	3.12 ± 0.21	0.62	97 ± 0.42
SBG_3	2.9 ± 0.13	3.20 ± 0.34	0.51	102 ± 0.61
SBG_4	2.9 ± 0.24	3.25± 0.11	0.47	100 ± 0.27
SBO_1	2.7 ± 0.42	3.34 ± 0.20	0.71	98 ± 0.65
SBO_2	2.5 ± 0.34	3.14 ± 0.23	0.56	97 ± 0.71
SBO_3	2.6 ± 0.15	3.27 ± 0.31	0.51	99 ± 0.38
SBO_4	2.5 ± 0.18	3.22 ± 0.10	0.63	99 ± 0.59

* Average of three determinations

Table 4: *In vitro* disintegration time, wetting time, water absorption ratio and drug Granisetron hydrochloride FDTs

Formulation Code	*In vitro* disintegration time* (sec) ± SD	Wetting time* (sec) ± SD	Water absorption ratio* ± SD	Drug Content* (%) ± SD
SBC_1	34 ± 1.26	40 ± 1.23	77 ± 1.30	99.78 ± 1.02
SBC_2	31 ± 2.33	43 ± 1.15	80 ± 1.13	100.44 ± 1.52
SBC_3	28 ± 1.32	44 ± 1.17	81 ± 1.49	98.23 ± 1.22
SBC_4	23 ± 1.50	36 ± 1.40	79 ± 1.28	98.88 ± 1.17
SBP_1	38 ± 1.22	43 ± 1.89	74 ± 1.19	99.15 ± 1.10
SBP_2	30 ± 1.51	38 ± 1.20	72 ± 1.12	98.54 ± 1.20
SBP_3	32 ± 1.25	40 ± 2.03	81 ± 1.23	98.20 ± 1.39
SBP_4	29 ± 1.41	39 ± 2.24	80 ± 1.52	99.62 ± 0.25
SBG_1	37 ± 1.17	41 ± 2.08	63 ± 1.22	100.08 ± 1.31
SBG_2	40 ± 1.37	43 ± 2.21	65 ± 1.41	99.29 ± 1.67
SBG_3	44 ± 1.60	48 ± 0.10	64 ± 1.57	98.74 ± 0.41
SBG_4	33 ± 1.33	50 ± 2.12	60 ± 1.43	100.39 ± 0.15
SBO_1	29 ± 1.05	40 ± 1.27	84 ± 1.30	98.81 ± 0.81
SBO_2	25 ± 1.11	47 ± 1.14	83 ± 1.33	99.62 ± 1.45
SBO_3	21 ± 1.23	39 ± 1.42	81 ± 1.38	100.11 ± 0.43
SBO_4	18 ± 1.46	36 ± 1.53	85 ± 1.52	99.83 ± 1.14

* Average of three determinations

concluded that fast dissolving tablets with improved Granisetron hydrochloride dissolution could be prepared by sublimation of tablets containing suitable subliming agent.

ACKNOWLEDGEMENTS

The authors are thankful to Natco Pharma. Ltd. Hyderabad. (AP - India) for providing Granisetron hydrochloride drug sample.

REFERENCES

Aapro M. Granisetron an update on its clinical use in the management of nausea and vomiting. Oncologist. 2004; 9:673-686.

Ahmed, I.S., Fatahalla, F.A. Pilot study of relative bioavailability of two oral formulations of ketoprofen in healthy subjects, a fast dissolving lyophilized tablet as compared to immediate release tablet. Drug Develop. Ind. Pharm. 2007; 33:505-11.

Ahmed, I.S., Nafadi, M.M. Fatahalla FA. Formulation of fast dissolving ketoprofen tablet using freeze-drying in blister technique. Drug Develop Ind. Pharm. 2006; 32:437-42.

Bi, Y., Sunada, H., Yonezawa, Y., Danjo, K., Iida, K. Preparation and evaluation of compressed tablets rapidly disintegrating in the oral cavity. Chem. Pharm. Bull. (Tokyo).1996; 44:2121-7.

Carmichael, J., Cantwell, B.M.J., Edwards, C.M., Zussman, B.D., Thomson, S. Rapeport W.G. and Harris, A.L., A pharmacokinetic study of Granisetron, a selective 5-HT3 receptor antagonist: correlation with anti-emetic response. Cancer Chemother. Pharmacol.1989; 24:45-49.

Chang, R., Guo, X., Burnside, B., Couch, R. A review of fast dissolving tablets. Pharm. Tech. North Am. 2000; 12:52-8.

Corveleyn, S., Remon, J.P., Formulation and production of rapidly disintegrating tablets by lyophilization using hydrochlorothiazide as a model drug. Int. J. Pharm. 1997; 152:215-25.

Fu, Y., Jeong, S.H., Park, K. Fast-melting tablets based on highly plastic granules. J Control Release.2005; 109:203-10.

Gohel, M., Patel, M., Amin, A., Agrawal, R., Dave, R., Bariya, N. Formulation design and optimization of mouth dissolve tablets of nimesulide using vacuum drying technique. AAPS Pharm.Sci.Tech. 2004; 5:36.

http;//en.wikipedia.org/wiki/granisetron.2011; 28th Jan.

Mishra, D.N., Bindal, M., Singh, S.K., Kumar, S.G. Spray dried excipient base: A novel technique for the formulation of orally disintegrating tablets. Chem. Pharm. Bull.2006; 54:99-102.

Omaima, A.S., Mohammed, A.H., Nagia, A.M., Ahmed, S.Z. Formulation and optimization of mouth dissolve tablets containing rofecoxib solid dispersion. AAPS Pharm.Sci.Tech. 2006; 7:55.

Sanger, G.J. and Nelson, P.R. Selective and functional 5-Hydroxytryptamine 3-receptor antagonism, Eur. J. Pharmacol.1989; 159: 113-124.

Suresh, S., Pandit, V., Joshi, H.P. Preparation and evaluation of mouth dissolving tablets of salbutamol sulphate. Indian J. Pharm. Sci. 2007; 69:467-9.

Upward, J.W., Amold, B.D.C., Link, C., Pieree, D.M., Allen, A., and Tasker, T.C.G. The Clinical Pharmacology of Granisetron, a novel specific 5-HT3 antagonist. Eur. J. Cancer.1990; 26: S12-S15.

Yunyun Jiang, Mei Lin, Guorong Fan, Yi Chen, Zhen Li, Weiquan Zhao, Yutian Wu, Jinhong Hu., 2006. Rapid determination of Granisetron in human plasma by liquid chromatography coupled to tandem mass spectrometry and its application to bioequivalence study. J. Pharm. & Biomed. Anal. (Epub ahead of print).

Table 5:Release profile of Granisetron hydrochloride FDTs

Formulation Code	$t_{50\%}$(min)*	$t_{90\%}$(min)*
SBC_1	0.58	6.02
SBC_2	0.51	3.59
SBC_3	0.45	2.57
SBC_4	0.41	2.01
SBP_1	2.02	7.03
SBP_2	1.06	5.07
SBP_3	1.01	4.07
SBP_4	0.48	3.05
SBG_1	2.56	9.03
SBG_2	1.56	6.51
SBG_3	1.41	5.01
SBG_4	0.59	4.01
SBO_1	1.42	6.53
SBO_2	1.01	4.56
SBO_3	0.52	3.48
SBO_4	0.47	2.51

* Average of three determinations

Table 6:Results of stability study

Formulation Code	*In vitro* disintegration time* (sec) ± SD	Wetting time* (sec) ± SD	Drug Content* (%) ± SD
SBC_4	20 ± 1.47	32± 1.11	98.82 ± 1.89
SBP_4	27 ± 1.26	36 ± 1.19	99.27 ± 1.63
SBG_4	29 ± 1.15	43 ± 1.30	99.48 ± 1.07
SBO_4	17 ± 1.29	33 ± 1.27	98.36 ± 1.35

* Average of three determinations