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Trigonella foenum- graecum as a Potential Hydrophilic Carrier for the Improvement of Solubility and Dissolution Rate of Curcumin

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ABSTRACT

Curcuminoids is one of the naturally occurring yellow pigments which consist of curcumin, demethoxycurcumin and bisdemethoxycurcumin[1]. *Curcuma longa* rhizome has been popularly used in traditional medicine and some extent it is one of the active ingredients in drugs and cosmetics exhibiting many pharmacological activities like anti-inflammatory, antiviral, antibacterial, antioxidant, antidiabetic etc[2]. Curcumin having high permeability and low dissolution rate[3]. The aim of our study was to enhance solubility and dissolution rate of curcumin by using fenugreek gum as a hydrophilic carrier. It has been observed that the solubility in water with plain curcumin was less as compared to curcumin with fenugreek gum as a hydrophilic carrier. It has been concluded that fenugreek can be used as a potential hydrophilic carrier for the improvement of solubility and dissolution rate of curcumin.

INTRODUCTION

CURCUMIN: Description: Curcumin is the principal curcuminoid of the popular Indian spice turmeric. Other two curcuminoids are desmethoxycurcumin and bis-desmethoxycurcumin. Curcuminoids are polyphenols and are responsible for the yellow color of turmeric. Curcumin can exist in at least two tautomeric forms, keto and enol. The enol form is more energetically stable in the solid phase and in solution. It is an orange crystalline powder[4]. **Family**: Zingiberaceae. **Common names:** Curcuma, Indian saffron, and haldi. **Molecular weight**: 368.38 **Empirical formula:** $C_{21}H_{20}O_6$ **Chemical name:** (1E,6E)-1,7-bis (4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione.

MATERIALS AND METHODS

EXTRACTION AND PURIFICATION

Soxhlet extraction

A large filter paper was used instead of a paper thimble. The paper was folded so that it could contain 20g of turmeric powder and was then placed in the soxhlet apparatus. 200mL acetone was heated and refluxed for extraction of the "filter paper thimble". The procedure was monitored until the yellow colour of the extractions faded after 5 h. An advantage with soxhlet extraction was that no further filtration was needed before it was concentrated. The obtained extract gave a crude yield of 2.6g [5] which was purified by Preparative TLC[6].

Fenugreek Mucilage

Trigonella Foenum-graceum, commonly known as Fenugreek, is a herbaceous plant of the leguminous family. It is a herbaceous plant of *leguminaceae*,family. The ripe fenugreek seeds have few medicinal values such as in the treatment of dysentery, dyspepsia, enlargement of liver, diabetes and chronic cough. Fenugreek seeds possess high percentage of mucilage which does not dissolve in water but it forms a viscous tacky mass when exposed to other fluids[7].

Extraction of Fenugreek Mucilage

Trigonella foenum graecum seed treated at 40^{o}C in a 5% NaCl solution adjusted to pH 3. After the treatment slurry was separated in water soluble and water insoluble fraction. The water

soluble fraction further purified by precipitating the gum with 95% EtoH: 5% 1-propenol in a ratio 1:1.5. Subsequently the product was dried in a conventional oven at 50^{o}C for 1 and half hour. The dried fenugreek gum was dissolved by wetting the powder in 95% ethanol with subsequently adding DW. The polymer was gently stirred and allow to fully hydrate over the night at 4^{o}C. Solution was placed on hot plate stirrer with setting of 120^{o}C. Further Centrifugation is done at 12000 rpm for 10 min to remove trace amount of protein[8].

***In-vitro* Drug Release**

The *in vitro* release of Curcumin formulation were studied through dialysis membrane using modified apparatus. The dissolution medium used was freshly prepared 0.1 N HCL (pH 1.2). Dialysis membrane, previously soaked overnight in the dissolution medium was tied to one end of a specifically designed glass cylinder (open at both ends).(10) Five ml of formulation was accurately placed into this assembly. The cylinder was attached to a stand and suspended in 100ml of dissolution medium maintained at 37±1°C so that the membrane just touched the receptor medium surface. The contents of the beaker were agitated on a magnetic stirrer. 2-3 ml of sample was withdrawn periodically and replaced with an equal volume of fresh 0.1N HCL (pH 1.2). Samples were diluted suitably and filtered through a filter paper (0.22µm, Whatman Inc., USA). The sample was then subject to the UV analysis against the blank (0.1N HCL solution). % cumulative release of CUR was calculated based on the standard UV calibration curve at 440 nm[9].

Table 1: UV Absorption at different ratio of Curcumin & Fenugreek polymer

Time	Abs 1:0	Time	Abs 0:1	Time	Abs 1:1	Time	Abs 1:2	Time	Abs 1:3	Time	Abs 1:4	Time	Abs 1:5
6:15	0.061	6:20	0.101	6:25	0.093	6:30	0.108	6:35	0.117	6:40	0.131	6:45	0.136
7:15	0.063	7:20	0.109	7:25	0.096	7:30	0.109	7:35	0.120	7:40	0.135	7:45	0.138
8:15	0.067	8:20	0.112	8:25	0.094	8:30	0.106	8:35	0.123	8:40	0.137	8:45	0.141
9:15	0.072	9:20	0.110	9:25	0.095	9:30	0.109	9:35	0.127	9:40	0.140	9:45	0.145
10:15	0.076	10:20	0.114	10:25	0.101	10:30	0.108	10:35	0.125	10:40	0.143	10:45	0.147
11:15	0.080	11:20	0.118	11:25	0.106	11:30	0.115	11:35	0.129	11:40	0.144	11:45	0.152
12:15	0.083	12:20	0.120	12:25	0.111	12:30	0.118	12:35	0.131	12:40	0.146	12:45	0.157
13:15	0.087	13:20	0.123	13:25	0.114	13:30	0.123	13:35	0.133	13:40	0.148	13:45	0.163
14:15	0.092	14:20	0.125	14:25	0.117	14:30	0.126	14:35	0.136	14:40	0.152	14:45	0.170
15:15	0.095	15:20	0.127	15:25	0.122	15:30	0.132	15:35	0.143	15:40	0.155	15:45	0.177
16:15	0.102	16:20	0.130	16:25	0.128	16:30	0.139	16:35	0.147	16:40	0.161	16:45	0.181

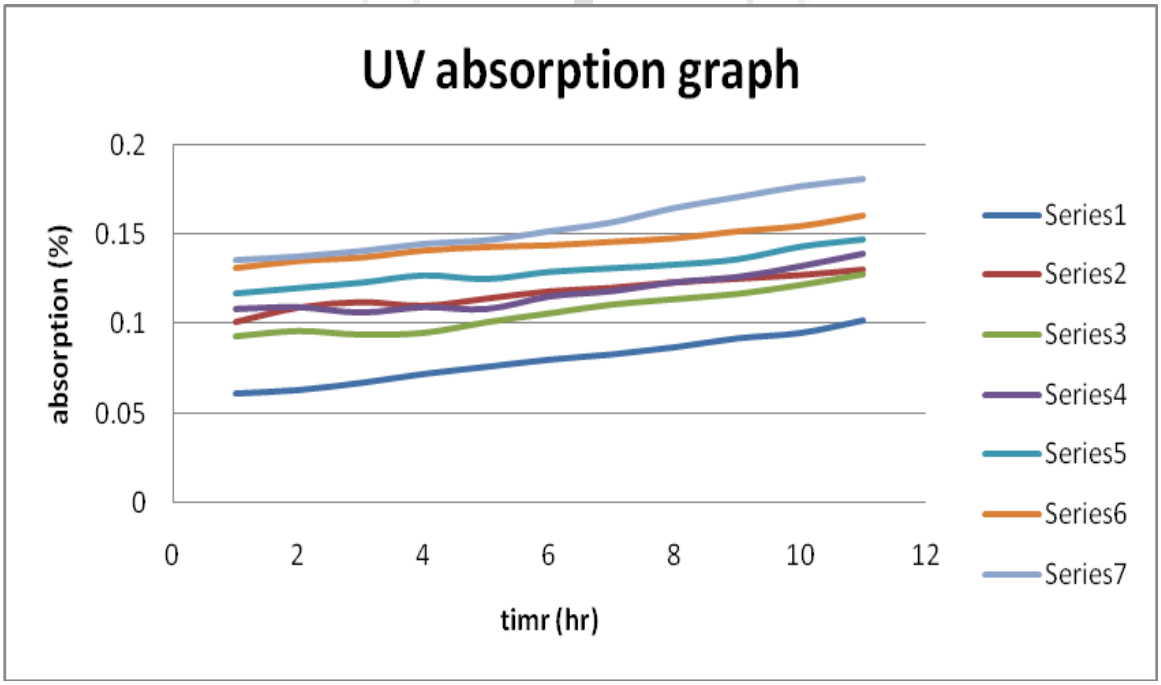

Fig. 1: UV Absorption at different ratio of Curcumin & Fenugreek polymer

RESULTS AND DISCUSSION

Fenugreek galactomannans has the maximum amount of galactose, the ratios being 1:1. Thus, galactose and mannose residues in fenugreek galactomannans are uniformly linked to provide maximum hydration and solubility which in turn minimized chain entanglement. Curcumin molecules can thus uniformly interact with galactomannan chains to produce more water soluble, compatible and stable form. It increases the solubility of curcumin as it can form a viscous solution in water in which curcumin can be uniformly suspended in a colloidal form. The presence of carrier may also prevent aggregation of fine drug particles thereby providing a larger surface area for dissolution. The wetting properties are also greatly increased due to the surfactant property of the polymer resulting in the increased interfacial tension between the medium and drug, hence the higher dissolution rate. The presence of carrier polymer also inhibits crystal growth of the drug which facilitates faster dissolution.

As the ratio of curcumin and fenugreek polymer increased from 1:1 to 1:2 , 1:3, 1:4, 1:5 the release increased since fenugreek is water soluble carrier so increase their amount in solid dispersion leading to increase the wettability and dispersibility of curcumin from the dispersion resulting in dissolution of curcumin in hydrophilic carrier.

CONCLUSION

Fenugreek (*Trigonella foenum-graecum*) has potential for the solubility and dissolution rate enhancement of poorly water soluble drug. Increase in solubility and dissolution rate was observed due to effect of hydrophilic polymer . Thus, it can be used as solubility enhancer and stabilizer in solid dispersion preparations.

REFERENCES

1. Govindarjan, V.,. Turmeric – chemistry,Technology and Quality. CRC Critical Review in Food Science and Nutrition, 1980, 12(3), 199-301.
2. Wang, P., Su, C., Li, R., Wang, H., Ren, Y., Sun, H., Yang, J., Sun, J., Shi, J., Tian, J. and Jiang, S.,Mechanisms and effects of curcumin on spatial learning and memory improvement in APPswe/PS1dE9mice, J.Neurosci.Res, 2013,PM:24273069.
3. Wu Y, Cui W, Eskin NAM, *et al.* An investigation of four commercial galactomannans on their emulsion and rheological properties. Food Res Int. 2009, 42: 1141-1146
4. Hatcher H, Planalp R, Cho J, Torti FM, Torti SV. Curcumin: from ancient medicine to current clinical trials. Cellular and molecular life science. 2008, 65 (11),1631–1652.

5. Revathy, S., Elumalai, S., Benny, M., and Antony, B. 2011. Isolation, purification and identification of curcuminoids from turmeric (Curcuma longa L.) by column chromatography. *Journal of Experimental Sciences* 2, (7): 21-25.
6. Pothitirat W, Gritsanapan W. Comparison of curcuminoids from Curcuma longarhizome by different methods of extraction. Proceedings of the 5th National Symposium on Graduate Research Conference, Bangkok, Thailand, October 10-11,2005.
7. S. Dharmendra , J.K. Surendra, M.Sujata, S. Shweta. "Natural Excipients- A Review."*International Journal of Pharmaceutical & Biological Archives.,* 2012; 3(5): 1028-1034.
8.Mebazaa,R.MahoudiaA.Foucheta,M.,Santosa,M.D.,Kamissokoa,F.,Naftic,A.Cheikhd, R.B.Regae,Bcamel V., (2009).” Characterisation of volatile compounds in Tunisian fenugreek seeds”Food chemistry,115.1326-1336.
9.Shaikh J, Ankola DD, Beniwal V, Singh D, Ravi Kumar MN. Nanop’cle encapsulation improves oral bioavailability of curcumin by at least 9-fold when compared to curcumin administered with piperine as absorption enhancer European Journal of Pharmaceutical Sciences, 2009, 37,223–230.