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# FORMULATION AND EVALUATION OF BUCCAL PATCH OF ATENOLOL

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**Abstract:**

The buccal patches of atenolol is design with hydrophilic polymers like Sodium alginate, Hydroxy propyl methyl cellulose, Carbopol 934P, PVP K-30, in their initial proportions and glycerin is used as plasticizer combinations were fabricated by solvent casting technique. The thebuccal patches are subject of great interest during recent years because it provides the possibility of avoiding the G.I.T. Contents. About 40% of drugs are lipophilic and failed to reach market due to their poor water solubility. The Buccal region is rich in blood supply, so the drugs administered in buccal region the patches are design and developed. The buccal mucosa is doing both systemic and local action. The buccal patches are preferred because they enter directly in systemic circulation and avoid hepatic first pass metabolism, due to this bioavailability of drugs are improved.

**Keywords:** Atenolol, Buccalpatches, Hydrophilic polymers, Solvent casting method.

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## INTRODUCTION:

The various Transmucosal routes, buccal route is an alternative oral route of administrating owing buccal mucosa has excellent convenience and region of smooth musclesand relatively immobile mucosa, hence suitable for administration of mucoadshesive dosage form.[1-2]The oral mucosa has rich blood supply that drains directy into systemic circulation and bypasses drugs from hepatic first pass metabolism by increasing the bioavailability[3]. Thus these factor make the oral mucosa a very attractive and feasible site for systemic drug delivery.[4] Mucoadshesion is the phenomenon between two materials which are held together for prolong period of time by interfacial force.It is generally referred as mucoadshesion when interaction occurs between[5-6]. The buccal cavity is easily accessible for self-medication and thus it is safe for patients. Ths the pharmaceutical aspects of mucoadsheinhave been reason of great interest in modern life because it provide the possibility of avoid gastrointestinal tract and due to this the degradation of drug in liver does not occur due to inactivation of first –pass metabolism of drug and increase bioavailability and patient compliance [7].

Atenolol (TENORMIN, others) is a β 1-selective antagonist [8]. The drug is excreted largely unchanged in the urine; thus, atenolol accumulates in patients with renal failure, and dosage should be reduced when creatinine clearance is 35 ml/min [9].The initial dose of atenolol for the treatment of hypertension usually is 50 mg/day, given once daily. The daily dose may be increased to 100 mg; higher doses are unlikely to provide any greater antihypertensive effect. [10] Atenolol has been shown to be efficacious, in combination with a diuretic, in elderly patients with isolated systolic hypertension [11].

The main aim to formulate buccal patches of atenolol to improve bioavailability by avoiding hepatic pass metabolism and thus improve the patient compliance and also to reduce the frequency of administration.

## MATERIALS AND METHOD:

**Materials:**

Atenolol was obtained from Rhydug Pharmaceutical Limited,Dehradun, Uttarakhand ,and the polymer like sodium alginate,HPMC.Carbopol 934 ,PVP K-30 and glycerine are obtained from institute sources,

**Drug Polymer Compatibility:**

Drug and polymer interaction observed under FTIR Spectroscopy by KBr method.

**Method of Preparation:**

The method of preparation of buccal patches of atenolol by given method:-

Buccal patches were prepared by solve composed of different proportions and combinations of SA (350to 450 mg), HPMC (50 to 1500 mg), CP 934 P (100mg), and PVP K-30 (150mg) to containing Atenolol (25 mg) were prepared using a 54-cm2 petri dish by solvent casting technique. Glycerin was incorporated as a plasticizer at a conentration of 7.5% w/w of dry weight of polymers. Backing membrane was casted by pouring 4% w/v aqueous solution of PVA on aluminum foil in petri dishes at 42°C and left for 10 h. Phosphate buffer saline, pH 6.8, was used as solvent in the casting method. Twenty five milligrams of atenolol was incorporated in mixtures containing different ratios and combinations of polymers and plasticizer. The matrices were prepared by pouring 40 ml of the homogeneous solutions on the PVA-aluminum foil backing membrane. Then, these buccal patches were dried at 42°C in an incubator (Yorco International Pvt. Ltd., India). After 24 h, the dried patches were removed from the petri dishes and kept in desiccators until use.

**Formulation**

**Table 1: Formulation Chart of Atenolol Buccal Patches**

| S.No. | Ingredients | F1 | F2 | F3 | F4 | F5 |
|---|---|---|---|---|---|---|
| **1** | Atenolol | 25 | 25 | 25 | 25 | 25 |
| **2** | Sodium alginate | 450 | 400 | 350 | 450 | 400 |
| **4** | HPMC | 50 | 100 | 150 | - | 50 |
| **5** | Carbopol 934 | - | - | - | - | - |
| **6** | , Polyvinyl pyrrolidine K-30 | - | - | - | - | 150 |
| **7** | Glycerine | 7.5% | 7.5% | 7.5% | 7.5% | 7.5% |
| **8** | Distilled Water | 20 | 20 | 20 | 20 | 20 |

## RESULTS AND DISCUSSIONS:

**Evaluation of Patches**

**Table 2: Evaluation Thickness, Weight Uniformity, and Folding Endurance of Buccal Patches of Atenolol**

| S.No | Formulation Code | Thickness (mm) | Weight Uniformity(mg) | Folding Endurance(times) |
|---|---|---|---|---|
| **1** | F1 | 0.55 | 120 | 162 |
| **2** | F2 | 0.53 | 130 | 147 |
| **3** | F3 | 0.57 | 150 | 170 |
| **4** | F4 | 0.58 | 162 | 182 |
| **5** | F5 | 0.54 | 170 | 189 |

**Thickness determination-**

The range of thickness of buccal patches of atenolol liesbetween the ranges from 0.53 to 0.58

**Weight uniformity-**

The range of weight uniformity of buccal patches of atenolol lies between the ranges from 120 to 170

**Folding endurance-**

Folding endurance of buccal patches of atenolol lies between the ranges from 147 to 189

**Table 3: Evaluation of Surface pH, %Moisture Absorption and %Moisture Loss**

| S.NO | Formulation Code | Surface pH | %Moisture absorption | %Moisture loss |
|---|---|---|---|---|
| **1** | F1 | 6.71 | 2.71 | 1.56 |
| **2** | F2 | 6.74 | 2.95 | 0.87 |
| **3** | F3 | 6.66 | 3.81 | 1.62 |
| **4** | F4 | 6.59 | 4.70 | 2.55 |
| **5** | F5 | 6.63 | 3.43 | 2.78 |

**Surface pH Determination-**

The range of surface pH of buccal patches of Atenolol lies between the ranges from 6.59 to 6.74

**%Moisture Absorption Determination –**

The range of % Moisture absorption of buccal patches of Atenolol lies between the ranges from 2.21 to 4.70

**%Moisture Loss Determination-**

The range of %Moisture loss of buccal patches of Atenolol lies between the ranges from 0.87 to 2.78

**Table 4: Drug content Uniformity**

| S.NO | Formulation Code | %Drug content Uniformity |
|---|---|---|
| **1** | F1 | 90.48 |
| **2** | F2 | 93.03 |
| **3** | F3 | 92.52 |
| **4** | F4 | 94.03 |
| **5** | F5 | 95.87 |

**Drug Content Uniformity Determination-**The total 5 formulations content of drug lies between the ranges 90.48 to 95.87.

***In-Vitro* Drug Release Studies of Atenolol Buccal Patches**

**Table 5: Cumulative % Drug Release**

| Time (hrs.) | F1 | F2 | F3 | F4 | F5 |
|---|---|---|---|---|---|
| **0** | 0 | 0 | 0 | 0 | 0 |
| **1** | 11.98 | 16.33 | 18.50 | 15.65 | 18.35 |
| **2** | 19.11 | 25.51 | 26.17 | 22.84 | 26.80 |
| **3** | 27.44 | 35.89 | 33.37 | 28.01 | 37.10 |
| **4** | 45.15 | 46.80 | 41.01 | 40.18 | 49.11 |
| **5** | 48.51 | 49.03 | 45.09 | 47.08 | 51.20 |
| **6** | 52.89 | 56.07 | 53.11 | 54.12 | 57.08 |
| **7** | 59.08 | 61.01 | 60.08 | 62.00 | 65.10 |
| **8** | 63.08 | 67.08 | 65.10 | 69.08 | 71.10 |

**Release kinetic Analysis:**

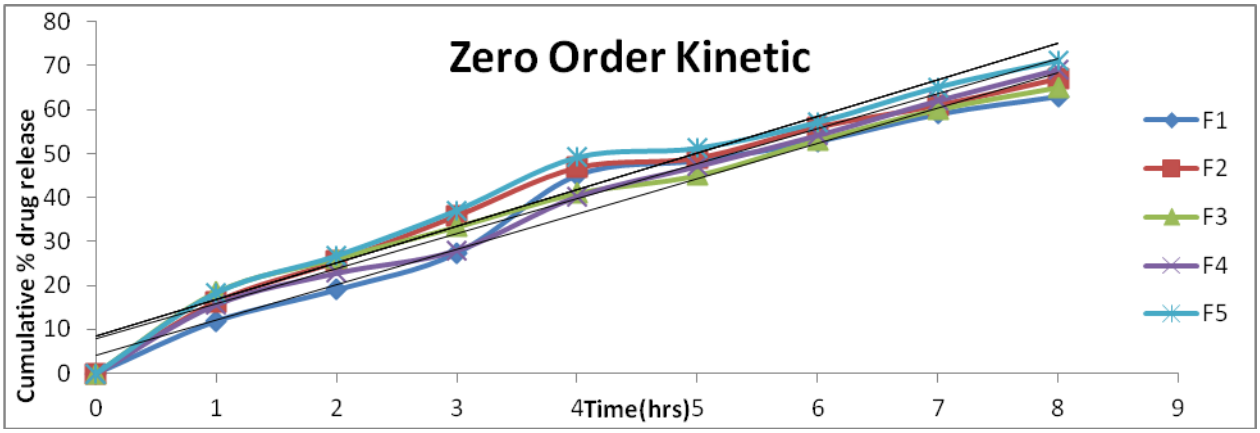


**Fig 1: Zero order release kinetic plot of formulation F1, F2, F3, F4, F5 of Drug Atenolol**

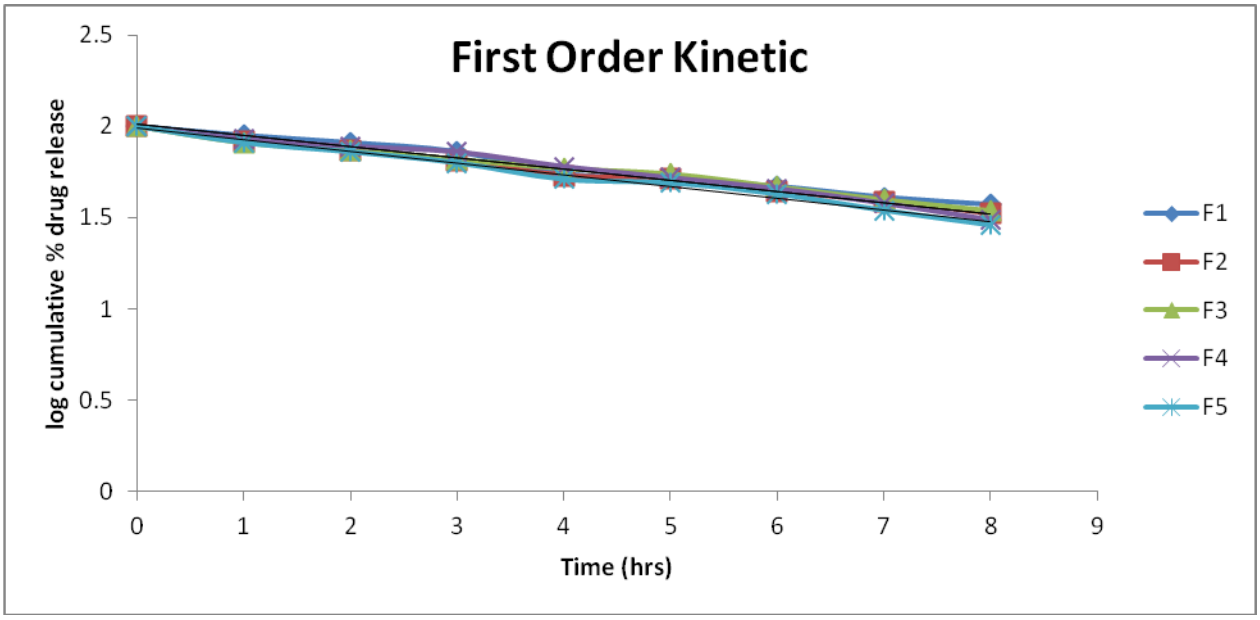


**Fig 2: First order release kinetic plot of formulation F1, F2, F3, F4, F5 of Drug Atenolol**

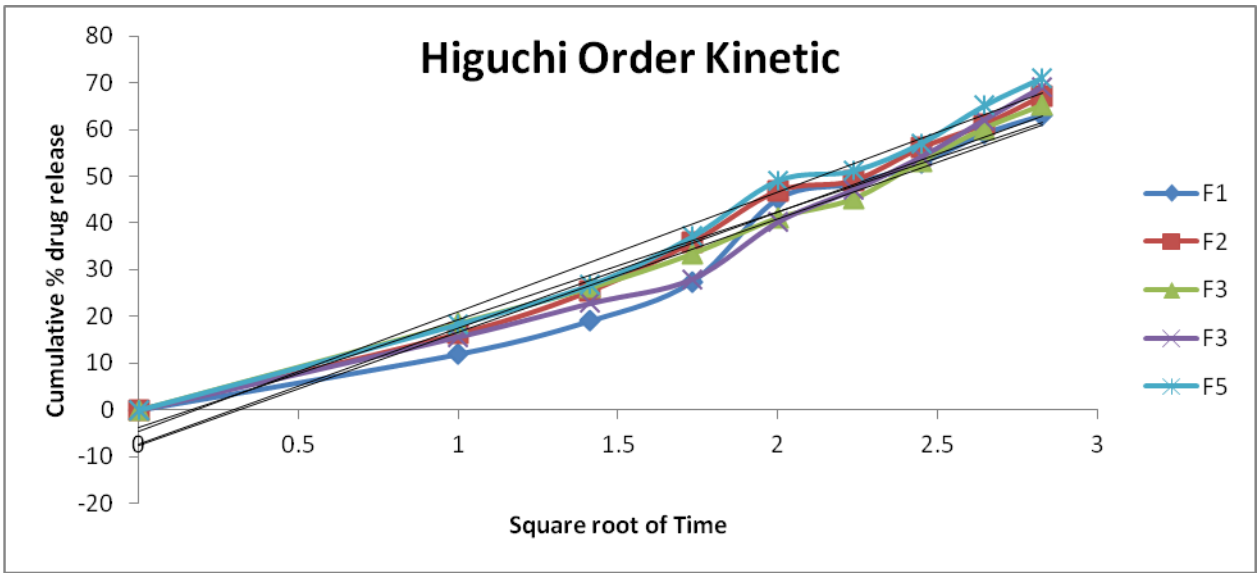


**Fig 3: Higuchi order release kinetic plot of formulation F1, F2, F3, F4, F5 of Drug Atenolol**

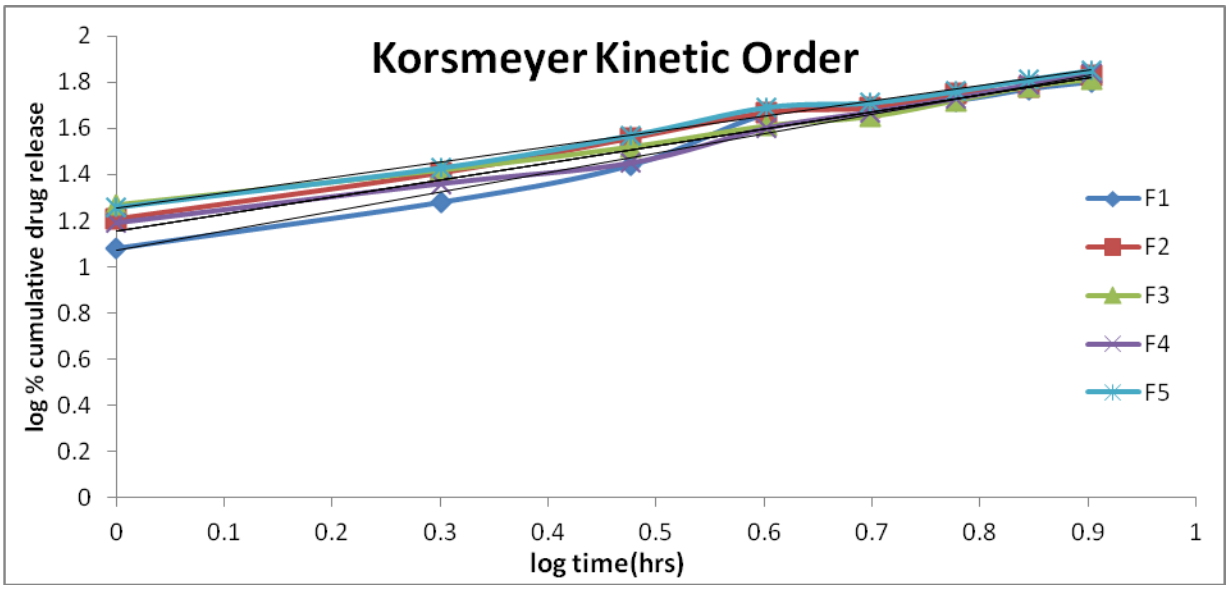


**Fig 4: Korsmeyer release kinetic plot of formulation F1, F2, F3, F4, F5 of Drug Atenolol**

**Table 6: Release kinetic Determination**

| Formulation code | Zero order | First order | Higuchi model | Korsmeyer pepaas |
|---|---|---|---|---|
| **F1** | 0.9638 | 0.9848 | 0.9455 | 0.9748 |
| **F2** | 0.9592 | 0.9944 | 0.9817 | 0.9921 |
| **F3** | 0.9688 | 0.9907 | 0.9827 | 0.9919 |
| **F4** | 0.9893 | 0.986 | 0.9524 | 0.9855 |
| **F5** | 0.9617 | 0.991 | 0.9809 | 0.9927 |

In the release kinetic studies of all the formulations 'r' value of Zero order Kinetic were in the range between0.9592 to 0.9893; similary the 'r'value of First order kinetic werein the range between 0.986 to 0.9944; similary the 'r' value of Higuchi order kinetic were in the range between 0.9455 to 0.9827; and similary 'r' value for Korsmeyer peppas order kinetic rangebetween 0.9748 to 0.9927indicating drug release from all formulations were found to follow zero order kinetics.

The *in-vitro* drug release data were subjected to goodness of fit test by linear regression analysis according to zero order, first order kinetic equation, Higuchi's and Korsmeyer models in order to determine the mechanism of drug release.

## CONCLUSION:

The buccal Patches of Atenolol is formulated with the help of various polymers like Sodium Alginate, HPMC, Carbopol 934 and PVP K-30 and glycerin is used as plasticizer. The formulation shows satisfactory physicochemical characteristics.

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