ABSTRACT SUMMARY: The ESA-SMEDDS concept: SMEDDS are generally formulated as liquids or adsorbed on to powders and designed as oral dosage form, which on dissolution with aqueous media generates a microemulsion in situ. We report a smart approach wherein SMEDDS are dispersed in coating solution prepared by dissolving polymer and curcumin in solvent system. Coating solution was loaded on an inert tablet as carrier. SMEDDS are effectively employed as a plasticizer for polymeric film coating deposited on inert tablet carrier. When dropped in aqueous media the matrix film dissolves and an in situ microemulsion of curcumin is generated to give rapid dissolution.

INTRODUCTION: Curcumin has a variety of biological activities and pharmacological actions. Despite the promising pharmacological effects, poor oral absorption due to its extremely low aqueous solubility and rapid metabolism result in very low oral systemic bioavailability, thus limiting its clinical use. Several strategies have been suggested to improve the oral bioavailability of curcumin and includes solid dispersions, nanoparticles, micelles, cyclodextrin inclusion complexes, phospholipid complexation, liposome encapsulation and many others. The first step in Bioenhancement of curcumin is improving solubility and dissolution rate. Self-microemulsifying drug delivery system (SMEDDS) have recently emerged as one of the most interesting approaches to improve the solubility, dissolution and oral absorption of poorly water-soluble drugs. In present study we report an innovative approach Enhanced Surface Area SMEDDS (ESA-SMEDDS) for Bioenhancement of curcumin.

OBJECTIVE: Objective of present study was to evaluate this innovative approach “ESA-SMEDDS” to obtain rapid dissolution of curcumin loaded tablet.

EXPERIMENTAL METHODS:
PREPARATION OF SMEDDS: SMEDDS were prepared by simple mixing of oil, surfactant and cosurfactant. Curcumin was dissolved in the SMEDDS formulation.

Screening of SMEDDS component:

- Equilibrium solubility: The solubility of curcumin in oils Capmul MCM, Captex300; surfactants Tween 80, Solutol HS 15 and CoS propylene glycol, polyethylene glycol (PEG 400) was determined. Excess of CUR was added to 1ml excipients vortex mixed and the CUR in the supernatant quantified by UV spectrophotometry at 425nm.
- Pseudoternary phase diagram: Water titration method was employed to construct ternary phase diagram. Briefly, mixture of oil, surfactant-CoS at various ratio were titrated with water.
- Inert tablet core: Inert tablet core was prepared by direct compression of MCC PH102 and Supertab 11 using 10mm standard concave punch.
- ESA-SMEDDS: Coating solution of SMEDDS loaded upon inert tablet core by spray coating (Fig. 1). The coating solution was prepared by dissolving Polymer, curcumin and SMEDDS/ TEC/ DBS into acetone: water (80:20) under stirring to form a clear solution. One formulation was developed without any plasticizer.

The ESA-SMEDDS film was prepared using different polymers like Eudragit EPO (CuEPIP1), Eudragit RLPO (CuRLAC1), Kollidone VA64 (CUVAAC1), Soluplus (CuSOAC1) and HPMC E5 (CuE5AC1) and screened for dissolution.

Photo micrographic study: Photomicrographs of films after coating were taken and observed under microscope.

Particle size: Particle size of blank SMEDDS, curcumin loaded SMEDDS was measured using Malvern Zetasizer. The solution was filtered through 0.5μ filter and observed through cross polarizer for confirmation of microemulsion formation. The
globule size of microemulsion formed was determined using Malvern Zetasizer. **In-vitro dissolution:** Dissolution study of different formulation was carried out using USP II paddle apparatus, in 900ml of 0.1N HCl containing 0.3% SLS and 1% SLS in water as dissolution medium at 75RPM. Curcumin was quantified by UV spectroscopy.

**RESULTS AND DISCUSSION:**

**PREPARATION OF SMEDDS:** Surfactants and CoS were selected based on solubility of CUR. CUR exhibited good solubility in T80 and Propylene glycol. CUR has low solubility in Captex300 and comparatively good solubility in Capmul MCM. Large ME region were observed with Capmul MCM as the oil compared to Captex300 oil irrespective of S/CoS evaluated (Figure 2). Combination of Oil: S-CoS (1:4) was further evaluated for globule size by variation in S-CoS ratio (1:1, 2:1,3:1, 4:1) (Table 1).

While ESA-SMEDDS formulation showed rapid and complete dissolution of drug, tablet coated with same film former and conventional plasticizer revealed less release. (Fig 3, 4 and 5) T50 value of ESA-SMEDDS is 7.5 min while for all other formulations it was significantly greater.(P<0.05)

This confirmed that ESA-SMEDDS technology through microemulsion formation enabled enhanced dissolution. Photomicrography also revealed clear and smooth films with ESA-SMEDDS while films with other plasticizers revealed crystals of curcumin.(Fig. 6). DSC studies also confirmed the same (Fig. 7). This further explains the higher release of curcumin from ESA-SMEDDS.

**CONCLUSION:** ESA-SMEDDS an innovative approach for Bioenhanced curcumin is simple Bioenhancement technology. Moreover this could be platform technology.

**ACKNOWLEDGMENT:** Phoenix for SRF, Konark Herbals for Curcumin, ABITEC for Capmul MCM, EVONIK, COLORCON, and BASF for Polymers.

**REFERENCES:**