



- Company Profile
- Products
  - Normal Film Coating
  - Moist Shield Coating System
  - Enteric Coating System
  - Speciality Products
  - Sustained Release System
  - Pharma R & D Coater
  - Instaglow
  - Instacoat Flavor
  - Instabind IC-820
- Publications
  - Modern Coating Techniques
  - Controlled Release Ranitidine Hydrochloride Tablets
  - Understanding Quality
  - Determining Individual Quality
  - Make/Buy Film Coating system
  - Solvents effects on Film Coating
  - Solvent to Aqueous Film Coating
  - Critical Aspects of Aqueous Film Coating
  - Instacoat Film Coating Systems
- Download Brochure
- Our Associates
- Enquiry Form
- Contact Us
- Home



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## MODERN TECHNIQUES OF COATING HERBAL AND NUTRACEUTICALS

*The past few years have witnessed the emergence of different types of polymers with specific advantages for coating tablets prepared from traditional ayurvedic formulations, say Suresh Pareek, Chetan Raj Sharad and Ashok Mohanty.*

Herbs have been used throughout time for cooking and as a primary tool for maintaining health and aiding in the recovery of disease. With the scientific medical revolution of the twentieth century, many of the age old remedies from folk medicine were discarded in the wake of powerful modern drugs. These drugs have however not fulfilled their promise of magical cures. Slowly however people are beginning to understand the problems with quick fix attitude toward health and disease. They are now slowly beginning to revert back to herbal medicines along with nutrition and holistic medicine.



Chetan Raj Sharad      Suresh Pareek      Ashok Mohanty

Modern science and technology can be put to use to make these herbal medicines into patient compliant dosage forms. These herbal medicines can be conveniently converted into tablets and capsules from their standardised herbal extracts in order to make them easy to swallow at the correct dose. From the recent advances in production technologies and availability of various new materials, these herbal dosage forms such as tablets can now be produced on high scale of production and can be coated for achieving various advantages such as improved stability, tastemasking, aesthetic appeal, extended release, or controlled release of the herb's marker compound. These latest techniques have led to virtually identical batches of the products. This consistency is extremely important for physicians and professional caregivers.

Batch size of 8 mm std. Concave tablets	100,000 nos.
Approximate weight per tablet	310 mg
Total weight of batch	31 kgs
Total weight gain (average)	4.50%
Instacoat Aqua Herbal required for the above batch	1.395 kgs. ( 31kgs x 4.5%)
Reconstitution Level	15% w/w

To help the herbal manufacturing industry, adapt their products to the growing sophistication in modern medicine, Ideal Cures research team has developed new materials for film coating of herbal tablets and this paper discusses its use in the herbal coated tablet production.

Aqueous film coating systems: Preparation of coating solutions ,powder dispersion and application of these in conventional coating pan systems is as described.

Procedure of reconstitution and preparation :  
 Reconstitution level: 15% w/w  
 Weight gain: 4 per cent to 5 per cent

Note : Weight gain will depend on the coating system, colour of the core tablet, colour of the coating system and the coating equipment used by the user.

Guidelines for calculation of reconstitution level :

For 15 kgs. of Instacoat Aqua Herbo 85 kgs of water will be required (reconstitution level being 15% w/w)  
Therefore for 1.395 kg of Instacoat Aqua herbal water required will be  $85/15 \times 1.395 = 7.905$  kgs.

Product preparation :

- Take a overhead or high shear mixer at a speed of 400-500rpm. The propeller diameter should be 1/3 the diameter of the container.
- Take the required amount of deionized/purified water ( in the example above it is 7.905 kgs) in a stainless steel vessel. Water temp. range should be 30 degrees C  $\pm$  5 degrees C.
- Start stirring the water to form a vortex (Vortex is created with the aid of a simple stirrer, the usage of a homogeniser is not recommended) then gradually add Instacoat Aqua herbal to the water.
- Continue mild stirring throughout the process.
- Continue the stirring for 45 minutes.
- After 45 minutes the solution is ready for coating.

All solutions prepared for the study was done using the above method of reconstitution.

The study involved the preselection of different types of polymers with specific advantages for coating of herbal tablets prepared from traditional ayurvedic formulations, as well as tablets prepared from standardised herbal extracts. The tablets used for the study as given in table 2.

Sr. No	Herbal extract used	Ingredients in the tablets	Type of ready mix used
1.	HARDA tablets		INSTACOAT SOL/INSTACOAT AQUA
2.	Triphala Tablets		INSTACOAT SOL/INSTACOAT AQUA
3.	Garlic extract tablets		INSTACOAT EN
4.	Multi ingredients traditional ayurvedic formula	Aconite, ajowan, asfoetida, carica pappya, chitrak, dhanti mool, gulwel kajli, nux , pippli mool, sajikshar, shankabhasma, suryashar, tamirinrd, bark ash, trikatu , yavakshar	INSTACOAT AQUA MOISTSHIELD
5.	traditional ayurvedic formula	Chandraprabha, gudchi, haridra, kanya lohadi	INSTACOAT SOL
6.	Standardised isolated herbal extracts	Ashwagandha, Nirgundi, Jatamansi, Shilajit	INSTACOAT AQUA HERBO
7.	Standardised isolated herbal extracts	Lycopene	INSTACOAT MOISTSHIELD
8.	Standardised isolated herbal extracts	Tinnia cordifolia extract	INSTACOAT AQUA HERBO

The tablets were studied for their density hardness friability and porosity of the substrate, which affected the adhesion of the film to the surface of the tablet substrate.

Three parameters that relate to the applied coating and its relationship with the tablet core were evaluated These are:

Tensile strength of the film coating : Increasing the tensile strength of the coating reduces the risk of cracking.

This was achieved by varying the polymers and their molecular weights as seen in.

Elastic modulus of the film coating: Reducing the elastic modulus of the film reduces the potential for bridging and cracking to occur. Suitable plasticization allows the coating to become more elastic.

Adhesion of the coating to the tablet surface: Amount of pigment suspension: The pigments generally have a positive impact on the coating formulation when they are properly dispersed. Instacoat readymixes have optimised pigment content which also help to reduce the moisture permeability of the core formulation.

Use of instacoat aqua natcol: This film coating system allows the manufacturer to use natural colours in all our readymixes such as Instacoat Aqua, Instacoat EN and Instacoat Herbo.

The table gives various colours available by use of the natural compounds.

Sr. No.	Colour	Natural compounds
1.	Yellow to orange	Natural Carotene powder
2.	Pink to magenta	Beetroot juice powder
3.	Yellow to orange	Anthocyanin extract powder
4.	Red	Paprika Powder
5.	Yellow to orangish red	Lutein extract
6.	Pink to red	Carmine extract
7.	Red	Annatto extract
8.	Red	Red sanders wood extract
9.	Green	Chlorophyll
10.	Yellow	Turmeric oleoresin

Use of Instacoat Aqua Herbo: Various combinations of natural polymers prepared from herbal extracts are developed in our laboratory, such as combination with naturally derived cellulose ethers of dextrans, gums, which impart good film forming properties. Even the other pigments that are used are from natural polymers. These are also available with natural colours.

Optimisation of various processing parameters such as temperature of drying, pan load, spray rate reconstitution levels of instacoat products was also carried out for herbal tablets.

Results and discussion :

The change in the viscosity of the polymer predominantly the cellulose ethers such as HPMC, HPC, MC affect the tensile strength of the film hence our products are standardised to have the right tensile strength of the film In all the herbal tablets that we studied for coating with our readymixes, none of the tablets showed signs of cracking or chipping during accelerated conditions of storage.

The elastic modulus of films was changed by changing different plasticizers such as glycerin, propylene glycol, peg 400 peg 6000 such that good quality films were obtained as free as well as applied films. The optimised formulae were used on herbal tablets and these when subjected to stability were found to be stable in terms of moisture permeability, colour fading, cracking or chipping.

The adhesion to the tablet surface depended on the porosity of the surface. In some cases of herbal tablets a seal coat was necessary to be given so as to get a good sheen and smooth film to the tablet surface.

The ingredients of the pigment suspension such as talc, titanium, lake colours or natural colours were found to have a positive effect on the formulation stability. In some of the herbal tablets we successfully added flavours to our coating mixes so as to mask the bitter under taste or the odour of the extracts.

Instacoat EN product is designed as an enteric coating material. Its use is recommended when a product needs to be released in the intestinal area to facilitate absorption or to avoid irritation to the gastric mucosa. Many herbal ingredients are known to cause stomach upsets due to irritation to the GI tract. This can be avoided by coating the tablet/pellets by Instacoat EN.

It also acts as a tastemasking coating since it does not dissolve in the mouth pH This product was studied for enteric coating of garlic tablets and was studied for its dissolution in gastric and intestinal media. Excellent release profiles were obtained in coat weight increase of 8 to 10 percent. Generally a precoat is required to be given to the tablets to get better performance of the enteric coat this enteric coat is available in different types depending upon the customers requirements.

All our products are studied for long term and accelerated stability studies at various conditions of storage. The R&D team also applies these readymixes to dummy tablets and keeps these on stability to observe changes in the film coat appearance, peeling, mottling, disintegration, etc.

All these studies on herbal tablets showed no change in physical properties except in natural colours where certain

colours tend to fade faster than synthetic colours. Optimisation of coating for herbal tablets was done on conventional coating pan with pilot type of spray gun with reservoir assembly.

The inlet air temperature was 75 degree C for aqueous formulae and 55 degree C for nonaqueous formulations, the exhaust air temperature was 35 degree to 40 degree C 200 cfm, pan speed was at 20 rpm with a tablet charge of 1-1.5 kg in the conventional pan and 45 kg in 36 inches pan, the spray air pressure was 40 to 50 psi for non aqueous and aqueous formula and quantity sprayed was 7.5 g/min. The quantity of coating applied varied from product to product.

The results presented in this discussion do indicate the suitability of various Instacoat film coating systems for preparing herbal film coated tablets.

Although our studies are done on some formulations as a baseline study, Instacoat film coating systems can be altered to suit your product by variation in its ingredients and to suit the customers production equipment.

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