



Saving time & trouble: Non-stick frying pans

What Is Nonstick Frying Pan?

Wrrought Aluminum utensils (cookware) are types of food preparation containers commonly found in the kitchen. Nonstick cookware comprises cooking vessels, such as saucepans and frying pans, intended for use on a stove or range cook top. Teflon (PTFE) coated (nonstick temp & oil resistant plastic material) aluminium utensils are being used in India and are proving to be popular. Teflon material is a fire resistant, slippery and non-sticky substance. The useful life of a utensil, its robustness and its satisfactory use make it popular among consumers.

Non-stick pans are generally available in sizes ranging from 200-350 mm for regular use. But most regularly sold size available in the market is around 235 mm.

Brands Tested

Consumer VOICE tested 9 popular brands of frying pans, 7 from the Teflon coating category

Products, which consumers buy and use, guide our choices for our test schedules. Consumer preferences are guided, we find, by two factors: the first is convenience, and the second, advertising pressure. In the case of Teflon coated frying pans, manufacturers play up the health factor a lot. It was for this reason that we decided to take these pans to the lab, because our main concerns are consumer health and the health of the environment, which also ultimately impacts consumer health. Getting best value for their money also drives consumer preferences. As we all know that any market product has its flip side and consumers need to be aware of the total product profile. In the utensils market, non-stick Teflon frying pans are very popular and the market response to consumer demand has resulted in multiple brands available to consumers. After duly surveying the market, our Technical Team chose the 'most sold', top seven brands of these frying pans. However what they found during their research was that many retailers also stocked what they called 'non-Teflon', non stick frying pans. On enquiry they were told these were nothing but the anodised versions of frying pans and only two brands were available in the market. We decided to test the lot. The tests are nothing short of surprising. For all the hype, our team found that the two anodized brands were as good, if not better, in all aspects, including the health angle.

Our tests brings you a detailed report and also lots of ad-on information in an easy to read format for full information on a product being used in most urban kitchens in India. Now, as always, the choice is yours!

Comparative Test

and two semi-non-stick pans popularly known as hard anodised. Name of the brands we tested are given below:

Brand	Rank
Non-stick Teflon	
1. Vinod	1
2. Crystal	2
3. Black Diamond	3
4. Anjali	4
5. Prestige	5
6. Elite	6
7. Scorpio	7
Anodised	
8. Hawkins (Futura)	1
9. Eagle	2

Packing

Packing is an important part of the product for safe upkeep, handling and transportation of product. The utensils should be packed in accordance with the best trade practice.

Brand Vinod and Hawkins (Futura) were packed in hard corrugated paper board box with internal support, hence considered

very good and hence got full score. Brand Crystal was packed in lower grade paper board box hence got lowest score among all the brands we tested.

Markings Information

All the brands tested fulfilled the minimum requirement of marking specified by Indian Standards namely size, trade mark, model/item code, MRP, standard mark, date of packing. Brands Vinod, Crystal, Anjali, Prestige and Hawkins were found adequate in marking as they provided all the necessary information related to the product. Brand Black Diamond did not mention the size of pan. Brand Eagle and Elite did not mention the date of packing. Model number and instructions for use were not found in brand Scorpio.

Thickness of Coating of Teflon (Non-stick material)

Teflon (polytetrafluoroethylene) (PTFE) is a fluorocarbon solid, and is a high-molecular-weight compound consisting wholly of carbon and fluorine. It has one of the lowest coefficients of friction against any solid. It is used as a nonstick coating for pans and other cookware. Teflon is very non-reactive, partly because of the strength

of carbon-fluorine bonds. It has one of the lowest coefficients of friction against any solid.

Teflon or other suitable nonstick material should be uniform inside the pan including rivets facing inside. The lid, if provided, may not have the same coating of nonstick material. However it should be either of stainless steel or any other coating of enamel or be anodised. The coating, after application, shall not release material harmful to the user when subjected to normal usage. The coating may contain suitable additives to colour the coating or to facilitate manufacture to enhance its appearances.

As per the Indian Standards, the indicated thickness of the coating shall not be less than 20 µm at four of the five position spots inside the pan in which it is measured, and at the fifth position shall not be less than 18. Except brand Anjali, all the brands we tested met the minimum requirement for thickness of coating. Brand Anjali did not meet the requirement and was placed at fifth position spot. In hard anodised category both Futura and Eagle brands met the requirements as that of Teflon (Nonstick) coated substances. Brand Futura scored highest in this test followed by Eagle and Crystal.

Key Findings

- Brand Crystal and Vinod had the maximum thickness of Teflon coating.
- Brand Vinod and Hawkins Futura were found most adequate in marking and packing.
- Brand Black Diamond, Anjali and Elite were supplied with proper accessories.
- Brand Hawkins Futura had maximum thickness (4.25mm) and Prestige had minimum thickness (1.77mm).
- All the brands were found satisfactory in salt corrosion resistance test, non stick quality test, adhesion tests and chila making test.
- All the brands we tested consumed negligible or no amount of cooking oil for making the omelet/chila.



Dos & Don'ts while using non stick frying pan

- Read the manufacturer's instructions carefully.
- Don't use cooking oil sprayer.**
- Never heat fat or oil at maximum temperature exceeding 270°C beyond smoke level.
- Don't overheat an empty non-stick pan.
- Use only recommended stirring utensils & avoid use of metal spoon/spatula.
- Use a soft sponge rather than a harsh metal scourer for cleaning.
- Avoid cleaning frying pan in dishwasher.
- Never rinse a hot frying pan in cold water.
- Do not use non-stick pans on induction cooker.

**Non-stick cooking oil sprayers are flammable and highly explosive which may be dangerous.

**Salt Water Corrosion Resistance**

As per this test, no defects additional to those initially present were observed in the coating. In this test the utensil was filled with salt solution (10 present NaCl in water) to a level more than half-way up the wall of the utensil. The solution was boiled in the utensil for 24 hour, during which time water was added as required, to maintain the liquid level within a band of 15 mm width. The 24 hour continuous period was maintained for 6 hour shifts on four successive days.

The coating was washed free of any adhering salt and immediately examined for any defects additional to those present at the first examination.

All the brands we tested passed this test.

Nonstick Quality (Omelet making test)

As per the Indian Standards, the coating shall permit the test foods to be removed intact without any amount of fried food material, stuck on the pan after the coated surfaces are wiped clean. In this

test, the body of the utensil should be prepared by wiping the inner surface lightly with vegetable cooking oil with a soft cloth and then washing with hot water containing a liquid detergent. The utensil was heated so that the temperature of the inner surface of the base was maintained between 150°C to 170°C. An egg broken into the utensil can then be cooked without additional fat or other edible oils until firmly set and then removed with a plastic spatula. The utensil was allowed to cool to room temperature and the coating wiped with a soft damp cloth.

All the brands performed satisfactorily and passed this test.

Adhesion

As per the Indian Standards, no complete squares and not more than 5 per cent of the coating shall be lifted (peeled off) from either the base or the wall of the utensil. The length peeled away shall not be greater than 2mm.

In this test, the coated utensil was immersed in vegetable cooking oil at 200 ± 10°C for 3 hours. It was cooled and washed thoroughly in hot water containing liquid

detergent to remove all oil and after a period of at least 60 minutes was cross-hatched on the coated area in approximately 2 mm² over a square with 25 mm sides using a new razor blade, so that the blade penetrates through the coating to the substrate.

A 25 mm wide strip of pressure-sensitive adhesive taps (which, when tested in accordance with Annex B of IS 13262, have an adhesion of not less than 800 g) was firmly pressed on to the cross-hatched area using thumbnail. The tape was then tugged off sharply by pulling it backwards at an angle of approximately 45° to the place of application. Another four strips of pressure-sensitive adhesive tape was separately applied to the cross-hatched area and removed in the same way.

All the brands we tested passed these tests and got full weightage that indicates the strong firmness of nonstick (Teflon) coating.

Accessories

The maximum number of accessories supplied with the frying pans were Lid (stainless steel), Spoon (wood), Scrubber and Recipe book.

Comparative Test

Dimension

In internal diameter test, the brands were tested against their claimed diameter and assign weightage accordingly. Brand Vinod was found closest to their claimed value of internal diameter and got full score in this test. In term of depth, the tested brands were considered to be better if higher in depth.

Brand Vinod scored highest in dimension tests followed by Prestige and Anjali, however brand Eagle scored the lowest.

Mass of Pan including handle

In this test, tested brands were assigned weightage for having the mass (in gram) and higher the better.

Brand Futura (867.1gms) was found heaviest among all followed by Vinod, however brand Elite (442.2gms) was found least bulky hence the thinnest.

Thickness of Pan

In this test, the brands were scored in terms of thickness as per the criteria of 'higher the better' as it gives uniform heating.

Brand Futura (4.25) was found having maximum thickness among all followed by Vinod (3.20) and Eagle (3.01), however brand Prestige (1.77) was found least in thickness.

Performance Test (Chila Making Test)

In this test, the coating must permit test foods to be removed intact without any amount sticking or coating the surface to be wiped clean.

All brands were found satisfactory in this test, hence got full score.

Conclusion and Recommendation

Out of the total number of frying pans tested, 7 pans were Teflon coated namely Anjali, Black Diamond, Crystal, Elite, Prestige, Scorpio and Vinod and two brand were Hard Anodised namely Hawking (Futura) and Eagle. Hard anodised frying pans were not Teflon coated but had slightly semi nonstick property like teflon coated nonstick frying pan and also selling in market as nonstick frying pan. The anodised coating is carried out on the utensils through

an electrolysis process by passing a low voltage electric current through an electrolyte solution where the ordinary pans are dipped for a certain time to deposit a thin coating that is called anodising. If the acid solution is cooled to the freezing point of water and the amount of electric current increased substantially, however, the process is called hard anodising.

Test programme for testing of non-stick frying pan was mainly based on Indian Standards (IS) 9730:2008 and other relevant standards.

The main parameters against which the samples tested were, thickness of coating, salt water corrosion resistance, adhesion tests and performance tests.

In the overall performance which was based on key parameters, brand Vinod ranked on top followed by Crystal and Black Diamond in Teflon coated non-stick frying pan category and brand Hawkins ranked highest, followed by Eagle in the hard anodised semi non-stick frying pan category. But if we look into the retail price then brands Crystal and Eagle were value for money but in terms of quality performance brand Vinod was outstanding.

What to look for a better non stick frying pan

- Flat, steady base, if you have a solid/radiant electric cook top. Generally a pan that's slightly concaved to begin with will flatten on heating. If your pan concaves on heating you may find the food runs to the sides of the pan.
- Suitable for induction cooktop, if you have an induction cooktop you'll need a frying pan that's made of ferrous metal (meaning it can be magnetised) and fits perfectly on one of the elements.
- Thick, heavy base, will generally give better heat distribution.
- Easy cleaning, avoid a painted exterior and grooved surface, and take into consideration the frying pan size and shape-for example, will it fit easily into your kitchen sink?
- Weight, will you be able to handle the load when it's filled with food?
- Handle, look for one with a soft moulded grip, this should help support the load.

“Brand Vinod topped in the overall performance test”



COMPARATIVE PERFORMANCE SCORE OF NON STICK/ ANODISED FRYING PANS

Parameter	Brand	Teflon Coated							Hard Anodised		
		Wt. %	Vinod	Crystal	Black Diamond	Anjali	Prestige	Elite	Scorpio	Hawkins	Eagle
Model			Zest	Taper Fry Pan	Selectra	LX Series	Omega Deluxe	Black Beauty	Xtra Thick	Futura	Mirchi Madness
MRP in ₹			625	650	797	715	595	650	490	875	562
Retail Price in ₹			530	488	638	536	506	506	367	744	478
General Parameters	20%										
Packing		3	3	1.8	2	2.5	2.5	2.5	2	3	2.7
Marking		4	4	3.95	3.5	3.95	3.95	3.7	3	4	3.7
Workmanship & Finish		4	3	3.5	3	3.5	4	3.5	3.5	4	3.5
Accessories		4	2	2	4	4	2	4	3.5	2	1
Robustness of Handle		5	5	5	4	4	4	3	4	5	5
Quality Tests	72%										
Thickness of Coating		20	14.4	14.77	13.93	11.42	12.55	12.8	10.82	18.49	17.24
Salt Water Corrosion Resistance		10	10	10	10	10	10	10	10	10	10
Non Stick Quality		10	10	10	10	10	10	10	10	10	10
Adhesion (Cross Hatch Test, Peel Test)		16	16	16	16	16	16	16	16	16	16
Dimensions											
a) Internal Diameter		3	3	1.73	1.5	1.99	2.24	1.98	1.47	2.22	1.47
b) Depth		3	2.78	2.5	2.64	2.92	2.74	2.7	2.62	2.49	2.4
Mass of Pan Including Handle		5	4.18	3.8	3.98	3.93	3.59	3.01	3.1	4.98	3.63
Thickness of Pan		5	4.16	3.92	4	3.76	3	3.2	3.56	5	4.01
Performance Tests	8%										
Chilla Making Test		8	8	8	8	8	8	8	8	8	8
Overall Score		100	89.52	86.97	86.55	85.97	84.57	84.39	81.57	95.18	88.65

Rating: >90 – Very good *****, 71-90- Good ****, 51-70- Average ***, 31-50- Poor **, upto 30 – Very Poor *

* Performance tests were conducted using required quantity of cooking oil.

Comparative Test

It's all about fat

Modern consumers prefer non-stick cookware as they want to avoid fat, but what consumers need to know is that fat is one of the most essential elements for our body and having less than the required amount of fat can impact our overall health.

Oil & Fat for Human Health:

Fat is an important component of diet and serves a number of functions in our body. It is a concentrated source of energy providing 9 kcal per gram.

- Dietary fats are derived from both plant and animal sources.
- Vegetable oils are major dietary sources of essential fatty acids and other unsaturated fatty acids called MUFA (Mono Unsaturated Fatty Acids) and PUFA (Poly Unsaturated Fatty Acid).
- Dietary fats provide essential fatty acids, which are functional components of membrane lipids and have other important metabolic functions.
- Vegetable oils except coconut oil are rich in unsaturated fatty acids.
- Fats that are used for cooking are termed as visible fats. Fats that are present in the food item are called invisible fat.
- Adults need to restrict intake of saturated fat.

RECOMMENDED DIETARY ALLOWANCE (RDA):

- Young children and adolescents require 25 grams visible vegetable oil/fat per day i.e. 750 grams per month.
- Adults with sedentary habits require 20 grams visible vegetable oil/fat per day i.e. 600 grams per month.

Pregnant and lactating women need 30 grams per day of visible vegetable oil/fat to meet their physiological needs i.e. 900 grams per month.

(Source: National Institute of Nutrition (NIN), Hyderabad)



Comparison of cookware metals at a glance

S.No.	Metal	Weight	Thermal Conductivity	Remarks
1.	Aluminum	Light	Very good	Not suitable for acidic foods, such as tomatoes.
2.	Anodized Aluminum	Light	Very good	Suitable for acidic foods also.
3.	Copper (tinning required)	Heavy	Best	Not suitable for acidic foods, such as tomatoes.
4.	Cast Iron	Heavy	Good	Not suitable for acidic foods, such as tomatoes.
5.	Stainless Steel	Medium	Poor	Non-reactive to acidic and alkaline foods (such as spinach). Recommended for storage of prepared foods.

For more information visit: <http://tubero.com/Teflon.html>, <http://articles.mercola.com>.