Sunscreen Creams

Care for a Walk under the Sun?

Many of us are confused to varying degrees when it comes to choosing a sunscreen because of the array of choices—and more importantly, because we are not sure what should our choice be based upon. How high should the sun protection factor (SPF) be (from 2 to 60 – that's how wide the range can be)? Should it block UVA or UVB? Should I be particular about it being a gel, a cream, or a spray? Should it be water-resistant or waterproof? Never the easiest thing to decide when it comes to personal care, and that's why this very important survey-and-comparative testing programme by *Consumer Voice* covering 12 popular brands available in India. And right time too, as the heat is already on!

One need only turn the pages of a lifestyle magazine or flip channels on the television, and there they are – big and not-so-big names giving us reasons, each more compelling than the other, why we must pick up their brand of sun protection magic. Almost all cosmetics companies today offer sun protection creams, with some herbal cosmetics manufacturers claiming to use ingredients from herbal/plant extracts. For its comparative testing, *Consumer Voice* has taken into account sun protection creams formulated from organic, inorganic or herbal ingredients based on the label declarations. These creams have been evaluated with regard to their quality, efficacy, performance as well as acceptability from both testing and user points of view.

BRANDS TESTED

Rank	Brand	Variant	Declared SPF Value	MRP, Rs	Packaging Material
1	Nivea	Moisturizing Immediate	30	199	HDPE (bottle)
2	Jovees	Sun Cover – Sandalwood	30	165	PVC (flexible tube)
3	Neutrogena	Fine Fairness	30	299	HDPE (bottle)
4	Lacto Calamine	Calamine with Lemon Extract	30	199	PVC (flexible tube)
5	VLCC	Matte Look – With Pineapple Extract	30	295	PVC (flexible tube)
6	Olay	Natural White Rich	24	299	HDPE (bottle)
7	Ayur	Protection Fairness	30	125	HDPE (bottle)
8	Revlon	Touch & Glow	N/A	145	PVC (flexible tube)
9	Lakme	Sun Expert – Oily Skin	30	250	PVC (flexible tube)
10	Dabur	Uveda	30	175	PVC (flexible tube)
11	Lotus	Sweat & Waterproof/Non-Greasy	30	275	PVC (flexible tube)
12	Biotique	Bio Aloe Vera	30	199	PVC (flexible tube)

KEY FINDINGS

- Sun protection factor is highest in Nivea (34.66) followed by VLCC (34.51) and Jovees (33.94) – against the declared SPF of 30. Therefore, the related PA (indicating the protection grade of UVA) factor is considered to be higher for these brands.
- Biotique contains a negligible amount of SPF (2.01) against the claimed 30 – hence, it is not recommended.
- The boot star values are five s tars each for Nivea, Neutrogena, Olay and Dabur, and no star for Ayur, Biotique, Jovees and Revlon.
- Nivea has the highest amount of total fatty substance (28.55), followed by Jovees (21.85). Lotus (6.85) and Biotique (6.30) have the least amount of total fatty substance.
- All the brands are well below the maximum limit for heavy metals and safe from the point of microbial contents as well.
- In photostability, Jovees and Lacto Calamine show very good results and get the highest scores. Dabur and Biotique are insoluble in water and hence not suitable for the photostability test.
- In the sensory tests, Nivea (23.50) is the top scorer followed by Olay (23.09).

BEST BUY	VALUE FOR MONEY
Nivea	Jovees

RELEVANT STANDARDS

The comparative testing has considered the requirements for sun protection creams and is primarily based on Indian Standard (IS: 6608 for skin creams). The other tests have been included based on the final draft international standard ISO/FDIS: 24443 and ISO/TC 217/WG 7 for determination of sun screen UVA/UVB photo protection and photostability, respectively, through *in vitro* method. Some parameters have been verified based on the specific claims of products.

TROPICAL PROTECTION

In a tropical country like India, where maximum regions experience hot to very hot and humid weather, the exposure to UVA and UVB (sunlight) rays is a regular phenomenon. It becomes imperative that one takes adequate measures to protect their skin from burns/ radiation, especially during the daytime when solar radiation is at its peak.

Sun Protection Factor (SPF)

The SPF of a sunscreen product determines how efficiently it absorbs or reflects some of the sun's ultraviolet (UV) radiation on the skin exposed to sunlight. It is a measure of protection against mainly UVB rays, the ones that cause sunburn. The higher the SPF number, the greater the protection.

Most of the brands are found to have a good SPF (closer or higher to the declared value) – ranging from 22.46 to 34.66. Biotique with an SPF of 2.01 SP factor is the exception with the lowest SPF contents – proving to be misleading against a declared value of SPF 30.

Boot Star

The boot star rating system is a proprietary in vitro method used to describe the ratio of UVA to UVB protection offered by sunscreen creams. The Boots Company – the UK-based sunscreen manufacturer and retailer – had developed this standard method that has since been adopted by most companies marketing these products in the United Kingdom.

The lowest rating is three stars, the highest being five stars. In our test, only four brands have the five stars rating: namely Nivea, Neutrogena, Olay and Dabur. Ayur, Biotique, Jovees and Revlon have got no star at all.

NOT THE SAME THING

The boot star rating system should not be confused with SPF, which is measured with reference to sunburn and UVB. The boot method uses a spectrophotometer to measure absorption of UVA vs UVB. A revision of the method now requires pre-irradiation of samples to give a better indication of UVA protection, and of photostability when the product is used.

THE SPF NUMBER: HOW MUCH SHOULD IT MATTER?

The SPF numbers can range from as low as 2 to as high as 60. These numbers refer to the product's ability to block out the sun's burning rays. The SPF rating is calculated by comparing the amount of time needed to produce sunburn on protected skin to the amount of time needed to cause sunburn on unprotected skin.

However, it is a common mistake to assume that the duration of effectiveness of a sunscreen can be calculated simply by multiplying the SPF by the length of time it takes for one to suffer a burn without sunscreen. In addition to the length of time spent in the sun, the amount of sun exposure a person receives is dependent upon other factors such as length of exposure, time of day, geographic location and weather conditions.

In fact, high SPF values are a problem. Studies have shown that people use this as a safety cover for staying out longer in the sun. During this time, though, one can receive large doses of UVA radiation. Several studies assert that above SPF 50+ the additional protection is very small.

Photostability

Photostability in the case of a sunscreen product is the ability to retain its efficacy upon exposure to UV. It is important that the product does not degrade with minimal UV exposure. It is important to know that a photo-unstable product could leave users at risk of uncontrolled exposure to UVB as well as UVA.

In order to determine the photostability of the tested brands, the samples are scanned spectrophotometrically at the range of 400nm to 700nm and specifically at 415nm to study the effect of light on them. Photostability is tested on two types of light effect: white light and UV light.

Jovees (white light 0.00 and UV light 0.70) and Lacto Calamine (white light 0.00 and UV light 6.18) show very good results of photostability and get the highest scores.

PHOTOSTABILITY RESULTS

Brand	White Light	Score out of 5	Ultraviolet Light	Score out of 5	Total Score out of (5+5)10
Jovees	0.00	5	0.70	4.93	9.93
Lacto Calamine	0.00	5	6.18	4.38	9.38
Revlon	6.54	4.34	5.60	4.44	8.78
Nivea	5.65	4.43	9.54	4.04	8.47
Neutrogena	7.74	4.22	9.67	4.03	8.25
Ayur	9.09	4.09	16.20	3.38	7.47
VLCC	19.46	3.05	9.92	4.0	7.05
Olay	15.75	3.42	28.00	2.2	5.62
Dabur*	Water insoluble	1.0	Water insoluble	1.0	2.0
Lotus*	Water insoluble	1.0	Water insoluble	1.0	2.0
Lakme	41.70	0.83	40.20	0.98	1.81
Biotique	33.47	1.65	48.95	0.10	1.75

**The samples of Dabur and Lotus were dissolved in distilled water but remained insoluble in water, rendering them unsuitable for the photostability test. These two brands have been given minimum weightage.*

IT EITHER ABSORBS OR REFLECTS

Sunscreen – also commonly known as sun block, sun-tan lotion, or sun-protection cream – is a creamy lotion or gel or other topical product that absorbs or reflects some of the sun's ultraviolet (UV) radiation on the skin exposed to sunlight and thus helps protect against sunburn as well as skin darkening. Skin-lightening products have sunscreen to protect lightened skin because light skin is more susceptible to sun damage than darker skin.

Sunscreens contain one or more of the organic chemical compounds that absorb ultraviolet light, or inorganic particulates that reflect, scatter and absorb UV light (such as titanium dioxide, zinc oxide, or a combination of both). Depending on the mode of action, sunscreens can be classified into physical sunscreens (those that reflect sunlight) or chemical sunscreens (those that absorb UV light).

Source: Wikipedia

THE SENSORY TESTS

Objective

The primary objective is to assess the overall acceptability of the sunscreen creams by users themselves.

Methodology

A total of 144 female volunteers (12 per product) in the age group of 18–35 years are selected after preliminary screening for medical complications. All the volunteers are provided coded samples along with the questionnaires containing more than 40 questions, which they need to fill up as per the rating scale of 5. Scores out of 5 are given for each attribute and their mean value is calculated for evaluating the total score.

Parameters Used

- Overall Efficiency and Acceptability
  The attributes: whitening effect; UV protection effect; brightens up skin tone; evens out skin tone; lightens spots; lightens pimple/acne scars; leaves skin looking radiant; does not clog pores; does not dry out the skin; has long-lasting moisturizing effect; skin feels comfortable all day; non-irritating to skin; suitable for daily use; suitable for summer; and suitable for winter
- Before Application
  The attributes: ease of taking out the right amount of the product; appearance; colour; fragrance; strength of fragrance
- During Application
  The attributes: texture; consistency; ease of spreading; speed of absorption
- Just after Application
  The attributes: moisturization; smoothness; softness; fairness of skin tone; radiance (applicable if the answer is 3 or 4 for earlier question); oiliness/greasiness; stickiness
- Feel on Skin throughout the Day
  The attributes: moisturization; oiliness/greasiness; stickiness; does the product leave patchy, white marks on skin; how likely you are to buy this product if it becomes available in the market at a reasonable price
- Any Problem Faced during Usage
  Users assess if they feel any discomfort while using the product.

VERDICT: Nivea is the top performer followed by Olay. *See table on next page*.

DO I NEED A SPECIAL SUNSCREEN FOR MY CHILD?

Proper protection from the sun is more important during childhood than at any other time in life. Childhood and teenage sunburn is a high-risk factor for developing melanoma, considered to be the most dangerous form of skin cancer.

Sunscreens that are formulated for children have a mild base designed especially for their sensitive skin. But there's no reason why children shouldn't use the family sunscreen, provided it doesn't irritate their skin. Test a small amount on the inside of their forearm first.

Keep babies and toddlers out of the sun as much as possible. The best protection for them is staying in the shade and using cover-up clothing—as it is for everybody. Dark, tight-woven clothing that covers all exposed skin is best. And while at it, get a hat with a wide brim that casts a shadow on the face.

SENSORY SCORES

Parameters / Brands	Overall Cream Efficiency and Acceptability	Before Application	During Application	Just after Application	Skin feel throughout Day	Any Problem Faced during Usage	Overall Score	Score out of 40
Mean score out of	(90)	(25)	(20)	(40)	(25)	(2)	(5)	
Nivea	75.37	17.82	13.82	24.06	17.01	2	4.09	23.50
Biotique	73.9	17.1	11.95	24.07	16.54	2	4.45	23.17
Olay	72.36	17.83	12.91	23.47	16.84	1.92	4.42	23.09
Ayur	71.98	16.74	12.5	23.09	16.34	1.92	4	23.02
VLCC	72.74	16.64	12.55	23.23	16.36	1.91	4.1	22.75
Jovees	70.02	17.08	12.58	23.57	16	2	4.42	22.64
Lotus	70.25	17.26	13.17	23.25	15.66	1.67	4.33	22.26
Lacto Calamine	69.82	16.46	12.46	23.39	15.9	1.91	4.18	22.24
Revlon	70.4	1667	12.67	23.86	16.08	1.83	4	22.14
Dabur	70.27	16.27	12.64	23.12	15.9	1.92	3.64	21.78
Neutrogena	69.47	17.58	12.76	22.97	16.33	2	4.25	21.77
Lakme	67.58	17.4	13.5	22.41	15.34	1.75	3.42	20.28

PHYSICO-CHEMICAL AND MICROBIAL TESTS

Gritty Matter/Skin Scratch

The cream may contain coarse matter or ingredients that scratch the skin during application, eventually leading to rashes on the skin.

- All the brands pass this test satisfactorily.

Thermal Stability (Discoloration, Separation, Emulsion)

Thermal stability is the resistance to permanent change in properties caused solely by heat. There should be no separation of water during this test.

- None of the brands show any separation of water and are thermally stable.

WATER CONTENT

The water content influences the physical properties of a product including weight, density, viscosity and refractive index. Water is required for the proper mixing of all the constituents and also to prevent the skin from getting dry.

The test results show that a major part of the sunscreen creams is water content, varying from 59.21 per cent to 88.22 per cent.

pH

Aqueous solutions at 25 degrees C with a pH less than 7 are considered to be acidic, while those with a pH greater than 7 are considered to be basic (alkaline).

All the tested brands are found to be within the specified range of 4–9. Lotus (5.11) has the lowest pH value and Revlon (7.44) the highest.

Total Fatty Substance (TFS)

It is one of the most important characteristics defining the quality of sunscreen creams. It is the fatty substance that keeps the skin glowing and also prevents the skin from getting dry. The Indian Standard requirement is minimum five percent.

The top score goes to Nivea (28.55), though all the other brands are comfortably above the minimum requirement of five per cent.

Heavy Metals

Heavy metals are metallic or chemical elements that have a relatively high density and are toxic or poisonous at high concentrations. For the comparative testing, Consumer Voice has considered toxic metals like lead, arsenic and mercury.

All the brands are well below the maximum limit for heavy metals.

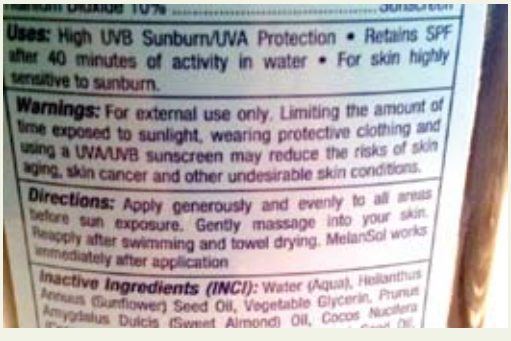
Microbial Contents

Since creams come in direct contact with human skin, the presence of microbes is not acceptable. As per Indian Standard, total viable count (TVC) should not be more than 1,000 cfu/gm in skin cream and gram –ve pathogens should be less than 10.

While gram –ve pathogens are absent in all the brands, the TVC is less than 10 cfu/gm for all. Thus, all the brands pass this test.

THE GENERAL TESTS

Packaging



For packaging quality, the following criteria are adopted for evaluation:

- Type and quality of packaging material
- Recyclability information/guidelines and possibility
- Tamper-proof seals of packaging
- Deceptive packaging

Among the brands tested, some have used HDPE-type packaging material for the bottles. Some have used PVC flexible tubes. Biotique and Jovees have the symbol of recycling on their packaging. Recycling information and tamper-proof seal are absent in Dabur, Lakme, Lotus, Nivea, Neutrogena, Revlon and Lacto Calamine. Recycling information is missing in Ayur, while VLCC is devoid of tamper-proof seal. Olay has deceptive packaging to some extent.

Marking

The details of marking and labelling are verified based on the Indian Standard requirements for skin cream, in addition to the specific claims as relevant to sun protection creams. The following aspects are checked for their compliance with the law as well as the legally binding labelling guidelines. Particular attention has been paid to claims/statements that could be considered to be misleading.

- Name and type of cream
- Manufacturers' address and/or recognized trademark , if any
- Net weight/quantity
- Batch no. or lot number in code or otherwise
- Month and year of manufacturing/packing
- Expiry date or 'best before'
- Storage conditions, if any, which may affect the cream quality
- List of ingredients in descending order
- Standard/Eco mark, if any
- Instruction for recyclability and packaging materials
- Direction for use/precautions
- SPF
- MRP

All the brands have provided relevant information as per IS requirement and also from the consumer's point of view.

In A Nutshell

Looking at sun protection factor per se, all the tested brands – except Biotique – can be considered for usage, having adequate quantity of SPF as declared. In terms of overall test performance including the sensory panel tests, Nivea is the top performer followed by Jovees. These two brands also demonstrate good photostability quality and contain adequate SPF. Nivea also scores in terms of total fatty substance – a defining factor for a good-quality sunscreen cream. Overall, Biotique has turned out to be a poor performer – contains a negligible amount of SPF, has no boot star value, has low levels of total fatty substance – and cannot be recommended.

MAKE YOUR SUNSCREEN EFFECTIVE

There are plenty of sunscreens available in cosmetics shops and also at the chemist's. So long as it is a broad-spectrum SPF30+ sunscreen, choosing one really comes down to what you prefer.

No matter what sunscreen you have selected, for it to be effective it must be used correctly.

- **Apply it at least 15 minutes before going outdoors.** It takes 20–30 minutes for sunscreen to be absorbed by the skin.
- **Sunscreen should be the last product applied, especially on the face,** since some sunscreens can break down in the presence of water contained in water-based foundations and moisturizers.
- **Reapply your sunscreen at least every two hours,** as well as after swimming or sweating, even if your sunscreen says it's waterproof and good for four hours.
- **Don't think sunscreen means you can stay out in the sun for longer** – it is just one way of reducing the risk of skin damage.

Tip: A sunscreen is only your third line of defence – behind wearing cover-up clothing and avoiding harmful UV radiation by keeping out of the sun between 10am and 4pm from September to April.

What does 'broad spectrum' mean?

The sun's light contains a few different categories of ultraviolet rays, particularly UVA and UVB rays. UVA rays can prematurely age one's skin, causing wrinkles and age spots. Increasingly, these are seen as capable of causing skin cancer on their own. These rays can pass through window glass. UVB rays are the primary cause of sunburn and are blocked by window glass.

Many basic sunscreens are pretty good at blocking out UVB (burning rays), but not UVA (ageing rays). Broad spectrum means the sunscreen will block out both UVA and UVB.

Comparative Performance Ratings of Sunscreen Creams

TEST PARAMETERS / BRAND	% Weightage	Nivea	Jovees	Neutrogena	Lacto Calamine	VLCC	Olay	Ayur	Revlon	Lakme	Dabur	Lotus	Biotique**
MRP (Rs)/Volume (ml/g)		199/75	165/100	299/50	199/50	295/100	299/50	125/100	145/50	250/100	175/50	275/100	199/120
Unit cost per 50ml/g, Rs		132.5	82.5	299	199	147.5	299	62.5	145	125	175	137.5	82.5
(I) PERFORMANCE	(64)	45.83	46.14	42.59	44.4	43.6	41.03	41.8	39.91	34.47	36.12	36.62	25.75
Sensory panel tests*	40	23.5	22.64	21.77	22.24	22.75	23.09	23.02	22.14	20.28	21.78	22.26	23.17
SPF	14	13.86	13.57	12.57	12.78	13.8	12.32	11.31	8.99	12.38	12.34	12.26	0.83**
Photostability	10	8.47	9.93	8.25	9.38	7.05	5.62	7.47	8.78	1.81	2.0	2.0	1.75
(II) PHYSICO-CHEMICAL TESTS	(36)	26.88	23.49	24.57	21.94	21.78	23.84	17.45	19.79	25.1	21.75	19.3	17.07
Gritty matter or skin scratch test	2	2	2	2	2	2	2	2	2	2	2	2	2
Thermal stability	2	2	2	2	2	2	2	2	2	2	2	2	2
Water content	4	3.98	2.54	3.77	3.26	3.55	3.55	1.30	3.16	3.80	3.87	3.09	1.51
pH	2	1.95	1.89	1.89	1.84	1.96	1.91	1.90	1.84	1.93	1.96	1.77	1.87
Total fatty substances	10	10	9.05	8.36	7.16	6.43	8.63	5.48	5.71	8.8	6.43	5.27	4.85
Total residues	3	2.97	2.03	2.57	1.69	1.86	1.77	0.78	1.09	2.58	1.51	1.19	0.88
Heavy metals (like lead and arsenic)	4	3.98	3.98	3.98	3.99	3.98	3.98	3.99	3.99	3.99	3.98	3.98	3.96
(III) MICROBIOLOGICAL TEST	(4)												
TVC & gram -ve pathogens	4	4	4	4	4	4	4	4	4	4	4	4	4
(IV) GENERAL TESTS	(5)												
Packing & marking	5	4	5	4	4	4.5	4.5	4.5	4	4	4	4	5
Total score (I+II+III+IV)		80.71	78.63	75.16	74.34	73.88	73.37	67.75	67.7	67.57	65.87	63.82	51.82
Overall score (rounded off)	100	81	79	75	74	74	73	68	68	68	66	64	30**

Rating: >90: Very Good*****, 71–90: Good****, 51–70: Fair***, 31–50: Poor**, <30: Very Poor

**Sensory panel test includes: overall cream efficacy and acceptability; judgement before application, during application and just after application; skin feel throughout day; any problem faced during usage; and overall score.*

***Downgraded due to very low amount of SPF (2.01) against declared SPF 30*