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# Formulation and Evaluation of Allopathic Sunscreen

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***Abstract:*** ***Sunscreen is a chemical substance that aids in UV radiation protection. Although UV B radiation causes sunburn, ultraviolet A radiation may be more harmful to the skin. The optimal sunscreen should obstruct both wavebands. The purpose of this study was to create a topical sunscreen formulation using medicinal herbs and some fixed oils. Frequent use of sunscreen prevents melanoma, squamous cell carcinoma, and actinic keratosis from developing. Chemicals in sunscreen can be either organic or inorganic. Sunblock lotion is another name for sunscreen. The product shields the skin from UV light by either reflecting or absorbing it. The usage of screening agents has increased due to the rise in skin cancer cases and the photodamaging effects of UV radiation. These agents have been demonstrated to be useful in lowering symptoms. Sunscreen ingredients should be completely safe, chemically inert, non-irritating, non-toxic, photostable, and capable of shielding the skin from sun harm.***

***Keywords: Zinc oxide, titanium dioxide, SPF (Sun Protection Factor), UVA, UVB, broad-spectrum, chemical, mineral, water-resistant, and photoprotective sunscreens.***

## I. INSTRUCTIONS

Lifestyle during the previous 50 years, including increased sun exposure from outdoor activities and deteriorating sunbathing habits. Chronic UV exposure causes "wrinkles, uneven skin pigmentation, loss of skin elasticity, and a disturbance of skin barrier functions" as well as other signs of aging skin. These "skin alterations superimposed on chronological aging alterations"

The product shields the skin from UV light by either reflecting or absorbing it. The usage of screening agents has increased due to the rise in skin cancer cases and the photodamaging effects of UV radiation. These agents have been demonstrated to be useful in lowering symptoms. Sunscreen ingredients should be completely safe, chemically inert, non-irritating, non-toxic, photostable, and capable of shielding the skin from sun harm.

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- *UVA:* The longest wavelength, 320–400 nm; it promotes instant tanning and sunburn and targets interior skin cells, including the dermis.
- *UVB:* Medium wavelength, 290–320 nm; impacts cells in epidermis; results in blisters, sunburn, and delayed tanning.
- *UVC:* The shortest wavelength, ranging from 100 to 290 nm, damages the outermost skin cells and results in lesions, ulcers, and redness.

UV filters that are both organic and inorganic are the active components of sunscreen. While inorganic filters reflect and scatter UVB rays, organic filters absorb it.[27] Broad protective spectrum sunscreen compositions

combine inorganic and organic UV filters. Octyl salicylate, an organ ic UV filter, and zinc oxide, an inorganic filter, are combined to create a sunscreen that is synthesized and compared to three commercial sunscreens with known SPF values (SPF=20, 30, and 40). An ester known as octyl salicylate is created when salicylic acid and 2-ethylhexanol condense. Zinc oxide is biocompatible, chemically inert, and non-toxic.

 

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## II. CLASSIFICATION OF SUNSCREEN

Sunscreens fall into the following categories.

*A. They Fall Into One Of Two Categories Based On How They Work*

*1) Physical Sunscreen:* deflects UV rays away from skin. For instance, titanium and zinc oxides.

*2) Chemical Sunscreen:* UV rays are absorbed For instance, oxybenzone, avobenzone, and microfine titanium dioxide.

The greatest sunscreen is thought to contain a blend of chemical and physical active components. A whitening phenomena is caused by the dispersion effect of physical sunblocks, although the safety of most organic compounds used in sunscreen formulas has not been shown.

*B. Based pn the Application*

*1) Topical:* To guard against dangerous radiation, they either absorb or reflect it.

*2) Oral:* These are taken orally to prevent skin damage. For instance, carotenoids Two kinds of topical sunscreens exist according to how they work as protective agents.

Sunscreen devided into two class:-

- Organic sunscreen
- Inorganic sunscreen

*3) Organic Sunscreen:* This type of sunscreen functions by entering into the skin and producing heat from UV radiation. Because of its thinness and suitability for daily use, skincare components can be added with ease. Chemically, organic sunscreen actives are based on carbon. Its active ingredient is non-mineral.

*4) Inorganic sunscreen:* These are particles that serve as a physical barrier to absorb ultraviolet and UV light, scattering and reflecting UV rays back to the surrounding environment. Since they encompass the whole UV spectrum, they are regarded as broad spectrum.

## III. MATERIALS AND METHODS

*A. Materials*

Octyl salicylate, zinc oxide, coconut oil, glyceryl Pola wax, propylene glycol, isopropyl alcohol, honey, and double-distilled water are the compounds employed in this investigation. For comparison, three commercial sunscreen samples with SPF-20, SPF-30, and SPF-40 are purchased from the market. All of the ingredients that go into making sunscreen are approved by the FDA as safe. Sisco Research Laboratory provides octyl salicylate, which is more than 99% pure. It is an oily, colorless liquid with a faint flowery scent. The zinc oxide utilized was extra pure (purity: 99.9%), with particles ranging in size from 10 to 60 nm. Used is 100% pure organic virgin coconut oil that has a smoke point of 175, is chemical-free, cold-pressed, centrifuge-extracted, and contains 82% saturated fatty acid. Glyceryl stearate and propylene glycol of laboratory grade (minimum purity 99%) are utilized. Dabur India's 100% pure honey is free of added preservatives, sugar, jaggery, and high fructose corn syrup. In this investigation, double-distilled water with a resistivity of 18MΩ-cm is employed (using a glass apparatus).

*1) Preparation of Sunscreen*

The emulsification of an oil phase and an aqueous phase produces the sunscreen. In the water phase, there is double distilled water (80%) and honey (4%), while the oil phase contains coconut oil (10%), glyceryl stearate (4%), and propylene glycol (2%). In a water bath, the oil and aqueous phases are heated independently for 15 minutes to 75°C. To achieve effective homogenization, the aqueous phase is gradually added to the oil phase while being constantly stirred and the temperature kept at 75°C. Until the liquid solidifies at normal temperature, it is constantly churned. The emulsion was then promptly supplemented with the powders of octyl salicylate (0.5%) and zinc oxide (0.5%) before it grew cold:Throughout the entire procedure, the emulsion was agitated to guarantee that every component was evenly mixed. After that, the emulsions were allowed to cool to room temperature. A cream without any powders and sunscreen containing octyl salicylate and zinc oxide powder are also created. The SPF ratings of the commercial sunscreens are 20, 30, and 40, respectively, and they are referred to as SPF-20, SPF-30, and SPF-40. Sun Block is the name of the sunscreen that was created for this investigation.

Or:

*B. Method*

*1)* Prepare the oil phase: In a container, combine coconut oil (10% of the total weight), glyceryl stearate (4% of the total weight), and propylene glycol (2% of the total weight).

*2)* Prepare the water phase: In another container, mix double distilled water (80% of the total weight) and honey (4% of the total weight).

*3)* Heat both phases: Place each container in a water bath at 75°C for 15 minutes. This helps to ensure that both phases are at the same temperature before combining.

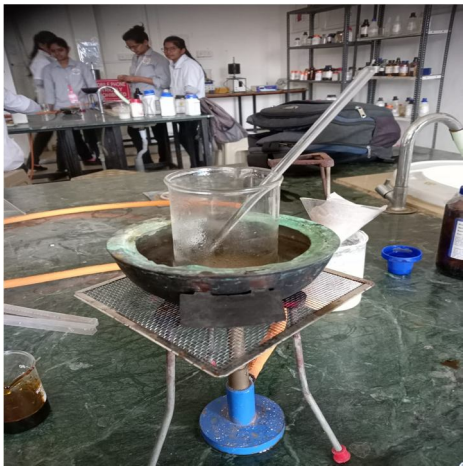
*4)* Water phase is added to oil phase

*5)* Combine the phases: Gradually add the water phase to the oil phase while stirring constantly. Maintain the temperature at 75°C to promote effective homogenization. Keep stirring until the mixture starts to congeal at room temperature.

*6)* Add the powders: Immediately after combining the phases, add octyl salicylate powder (0.5% of the total weight) and zinc oxide powder (0.5% of the total weight) to the emulsion. Continue stirring throughout the process to ensure all components are uniformly mixed.

*7)* Cool down: Allow the emulsion to cool down to room temperature. This will help it solidify and become a stable sunscreen.

Aques phase (fig-1)



Oil phase (fig-2)

| Chemicals | Quantity (100gm) |
|---|---|
| Octyl salicylate | 0.5% |
| zinc oxide | 0.5% |
| coconut oi | 10% |
| Pola wax | 4 % |
| Honey | 4 % |
| double-distilled water | 80% |
| propylene glycol | 2% |

(Table:-1)

## IV. EVALUATION OF SUNSCREEN

### *A. Physical Parameters*

Color: The formulation's color was personally examined and noted.
Odor: To test the formulation's scent, preparation was applied to the hand and the aroma was felt.
Visual inspection was conducted to assess the formulation's appearance.

### *B. Determination of pH*

Through the use of a digital pH meter, sunscreens' pH was measured. After 1 g of the formulation was dissolved for 2 hours in 100 ml of freshly made
distilled water, the pH was determined. Ensuring that the pH of the manufactured herbal sunscreens is comparable to the skin's pH after a full day of use was the aim of this investigation. Triple checking of the results was done, and S.D. was noted.

### *C. Determination of Viscosity*

Viscosity was measured using the Brookfield viscometer, which was equipped with the appropriate number of spindles. 50 g of preparation were kept in a 50 ml beaker until the rpm was adjusted and the spindle groove was dipped. The viscosity of the sunscreen was measured at 5, 10, 20, 50, and 100 rpm. The factor derived from the reading was used to calculate the viscosity.

### *D. Spreadability*

The therapeutic efficacy of sunscreens was measured by their spreadability. The two sides took the prescribed amount of time in seconds to slip off when the proper amount of sunscreen was put in between them and under the load directions. Spreadability was described as how long it took to divide two slides into different halves in less time.

### *E. Stability*

A seven-day study of the prepared formulation's stability was carried out at room temperature. Subsequently, the formulation was examined for 20 days at 45 ±1°C. The formulation was observed on the 0th, 5th, 10th, 15th, and 20th day for all evaluation parameters, and it was maintained at both ambient temperature and an elevated temperature.

### *F. Testing for Stability*

A seven-day study of the prepared formulation's stability was carried out at room temperature. Subsequently, the formulation was examined for 20 days at 45 ±1°C. The formulation was
observed on the 0th, 5th, 10th, 15th, and 20th day for all evaluation parameters, and it was maintained at both ambient temperature and an elevated temperature.

### *G. SPF Determination*

The in-vitro effectiveness of herbal sunscreens was investigated using a UV Visible spectrophotometer. 0.050 g of herbal sunscreen creams were dissolved in 50.0 ml of ethanol to create a 0.10 percent (w/v) solution in ethanol. Aliquots of each herbal sunscreen were scanned at 5-nm intervals between 290 and 320 nm. This formula was used to determine SPF. Every sample underwent three analyses.

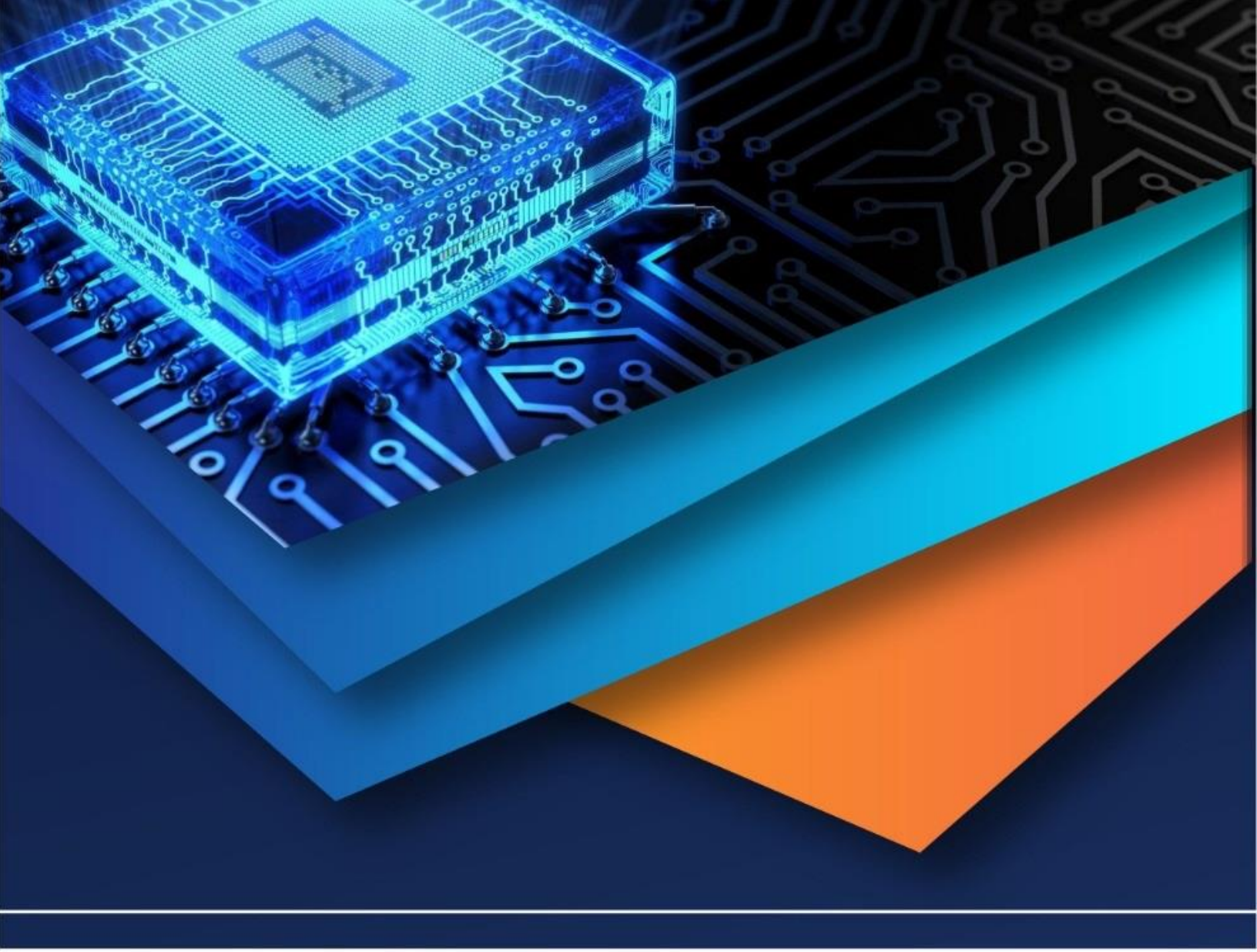
## V. RESULT AND DISCUSSION

The UV absorption spectra of many sunscreens. The spectra clearly show that the sunscreen manufactured in this study (called Sun Block) with octyl salicylate and zinc oxide has better absorption qualities than commercial sunscreens with SPF-20, SPF-30, and SPF-40 that are purchased from the open market.

Octyl salicylate was suggested by Ana Flo Sierra et al. as a way to shield skin from UV ray damage. Sun Protection Factor, or SPF for short, is a scientific metric that indicates how much the usage of sunscreen reduces the risk of skin damage. Sun protection factor (SPF), which indicates the percentage of UV photons that cause sunburn that actually reach the skin, is a typical rating and labeling system for sunscreens. The Mansur mathematical equation is used to compute the SPF values.

## REFERENCES

[1] Joanna A. Ruszkiewicza, Adi Pinkasa, Beatriz Ferrera, Tanara V. Peresa, Aristides Tsatsakisb and Michael Aschnera. Neurotoxic effect of active ingredients in sunscreen products, a contemporary review. Toxicology Report. 2017, 4, 245-249
[2] Rogers, H.W., Weinstock, M.A., Harris, A.R., Hinckley, M.R., Feldman, S.R., Fleischer, A.B. and Coldiron, B.M. Incidence estimate of nonmelanoma skin cancer in the United States. Arch Dermatol. 2010, 146, 283-287.
[3] Fonseca AP* and Rafaela N. Determination of Sun Protection Factor by UV-Vis Spectrophotometry. Health Care: Current Reviews. 2013. 1.
[4] Kluschke, F., Weigmann, H.J., Schanzer, S., Meinke, M., Vergou, T., Sterry, W. and Lademann, J. Gain or loss? Sunscreen efficiency after cosmetic pretreatment of the skin. Skin Pharmacol Phys. 2014, 27, 82-89.
[5] Vergou, T., Patzel,t A, Schanzer, S., Meinke, M.C., Weigmann, H.J., Thiede, G., Sterry, W., Lademann, J. and Darvin, M.E. Methods for the evaluation of the protective efficacy of sunscreen products. Skin Pharmacol Phys. 2013, 26, 30-35.
[6] Koh, H.K. Prevention and Early Detection Strategies for Melanoma and Skin Cancer. Archives of Dermatol. 1996, 132, 436.
[7] Gupta,V.K., Zatz, J.L. and Rerek,M. Percutaneous absorption of sunscreens trough microyucatan an pig skin in vitro. Pharm. Res., 1999, 16, 1602–1607.177
[8] Ana FloSierraa Maria, L. Garduño Ramírezb Ana, C. Calpena Campmanya Adolfina, RuizMartínezcBeatriz and ClaresNaverosc In vivo and in vitro evaluation of the use of a newly developed melatonin loaded emulsion combined with UV filters as a protective agent against skin irradiation. Journal of Dermatological Science, 2013, 69, 202-214
[9] Francis P. Gasparro*l, Mark Mitchnick* and J. Frank Nash, A Review of Sunscreen Safety and Efficacy, Photochemistry and Photobiology, 1998, 68(3): 243-25
[10] Sarveiya, V., Risk, S. and Benson, H.A.E. Liquid chromatographic assay for common sunscreen agents: application to in vivo assessment of skin penetration and systemic absorption in human volunteers. J. Chromatogr. 2004,803, 225–231.
[11] Kaidbey, K. H. and Barnes A. Determination of UVA protection factors by means of immediate pigment darkening in normal skin. J.Am. Acad. Dermatol. 1991, 25,262-266.
[12] Kaidbey, K. H. and Gange, R.W. Comparison of methods for assessing photoprotection against ultraviolet A in vivo. J. Am. Acad. Dermatol.1987,16,346-353.
[13] Stanfield, J. W., Feldt, P.A., Csortan, E.S. and Krochmal, L. Ultraviolet A sunscreen evaluations in normal subjects. J.Am. Acad. Dermatol. 1989,20,744-748.
[14] Diffey, B. L. A method for broad spectrum classification sunscreens.Int. J.Cosmet. Sci. 1994,16,47-52. (a) Diffey, B. L. and Lark. O. Clinical climatology. Photodermutology1984,1,30-37. (b). Diffey, B. L. Analysis of the risk of skin cancer from sunlight and solaria in subjects living in northern Europe. Photodermatology1987, 4,118-126.
[15] Holick, M. F.,MacLaughlin, J.A. and Doppelt, S.H. Factors that influence the cutaneous photosynthesis of previtamin D3. Science 1981, 211,590-593.
[16] MacLaughlin, J. A,, Anderson, R.R. and Holick, M.F. Spectral character of sunlight modulates photosynthesis of previtamin D, and its photoisomers in human skin. Science 1981, 216, 1001-1003.
[17] de Gruijl, F. R. and Forbes, P.D. UV-induced skin cancer in a hairless mouse model. Bioessays1995, 17,651-660
[18] Bissett, D. L., Hannon, D.P. and 0rr, T.V. An animal model of solar-aged skin: histological, physical, and visible changes in UV-irradiated hairless mouse skin. Photochem. Photohiol. 1987, 46,367-378.
[19] Poon, T. S. C., Barnetson, R. S. and Halliday, G. M. Prevention of Immunosuppression by Sunscreens in Humans Is Unrelated to Protection from Erythema and Dependent on Protection from Ultraviolet A in the Face of Constant Ultraviolet B Protection. J. Invest. Dermatol. 2003, ,121, 184–190.
[20] Serpone, N., Dondi, D. and Albini, A. Inorganic and organic UV filtersTheir role and efficacy in sunscreens and suncare products. InorganicaChimica Acta 2007, 360, 794–802.
[21] Im, J.S., Balakrishnan, P., Oh, D.H., Kim, J.S., Jeon, E.M., Kim, D.D., Yong, C.S. and Choi, H.G. Evaluation of salicylic acid fatty ester prodrugs for UV protection. Drug Dev. Ind. Pharm. 2011,37, 841–848.
[22] Simonsen, L., Petersen, M.B. and Groth, L. In vivo skin penetration of salicylic compounds in hairless rats. Eur. J. Pharm. Sci. 2002, 17, 95–104.
[23] Von Weis, J.F. and Lever, W.F. Percutaneous salicylic acid intoxication in psoriasis. Arch. Dermatol. 1964, 90, 26–29.
[24] Fonseca, A.P. and Rafaela, N. Determination of Sun Protection Factor by UV-Vis spectrophotometry. Health Care Current Reviews. 2013, 1, 1-4.
[25] Mansur, J.S., Breder, M.N., Mansur, M.C. and Azulay, R.D. Determination of Sun Protection Factor by Spectrophotometry. An Bras Dermatol1986, 61, 121-124.
[26] Suva, M.A. Evaluation of Sun Protection Factor of Zingiber officinale Roscoe Extract by Ultraviolet Spectroscopy Method. Journal of PharmaSciTech. 2014, 3, 94-97.
[27] Sayre, R. M., Agin, P. P., Levee, G. J. and Marlowe, E. Comparison of in vivo and in vitro testing of sunscreening formulas. Photochem. Photobiol. 1979, 29, 559-566.
[28] Chou, J., Robinson , T. J. and Doan, H. Rapid Comparison of UVB Absorption Effectiveness of Various Sunscreens by UV-Vis Spectroscopy. J. Anal. Bioanal. Tech.2017, 08,355.



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