International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

# Exploring the Science behind the Color Selection of Tablets and Drugs: A Spectrum-Based Analysis

*Ekta Khare*, Dr. Devendra Kishore*

*GCRG College of Pharmacy, BKT, Lucknow 271835, U.P., India*
*Doi:* https://doi.org/10.55248/gengpi.5.0324.0909

**A B S T R A C T**

The color of tablets and drugs is a crucial aspect of pharmaceutical design, influencing consumer perception, medication adherence, and brand recognition. White and orange are two commonly used colors in the pharmaceutical industry, each serving distinct purposes, and evoking different responses.

Understanding the wavelength properties of colors in the spectrum provides valuable insights into the psychological and physiological effects of white and orange tablets and drugs on patients. By aligning color choices with the intended messaging and brand image, pharmaceutical companies can optimize the design and packaging of medications to enhance consumer trust, engagement, and adherence. This article explores the scientific rationale behind the preference for white and other colors in tablet and drug manufacturing, based on the wavelength of the spectrum by using formulaes.

Keywords: Spectrum, Wavelength, Color, Tablet, Drug, Pharmaceutical Industry, Physics

## 1. Main text

White tablets and drugs have long been favored for their association with purity, cleanliness, and neutrality. From a spectral perspective, white reflects all wavelengths of visible light, giving it a colorless appearance. This makes white tablets versatile and compatible with a wide range of active pharmaceutical ingredients, excipients, and coatings, ensuring the stability and efficacy of the medication.

In contrast, the color orange, being a blend of red and yellow on the spectrum, is perceived as warm, energetic, and attention-grabbing. Orange tablets and drugs stand out on pharmacy shelves, aiding in product differentiation and brand recognition. The wavelength of orange light stimulates a sense of vitality and positivity, potentially influencing consumer behavior and enhancing the overall user experience. The selection of tablet colors, whether white or orange, is also influenced by factors such as cultural associations, marketing strategies, and regulatory requirements. While white tablets are often preferred for their perceived purity and compatibility, orange tablets offer a unique visual appeal that can attract consumers and facilitate medication compliance.

In conclusion, the color selection of tablets and drugs goes beyond aesthetics, encompassing a multidimensional approach that considers scientific, psychological, and marketing perspectives. By leveraging the unique properties of white and orange based on the spectrum wavelength, pharmaceutical manufacturers can create visually appealing and effective medications that cater to the diverse needs and preferences of consumers.

Pharmaceutical companies typically choose to keep the color of medicine white, or if necessary, opt for another suitable color. This decision is based on scientific reasons. The visible spectrum ranges from approximately 380-700 nm, with different colors having varying wavelengths. The order of wavelength of visible radiation colors is as follows:

**Violet < Indigo < Blue < Green < Orange < Red.**

Red color has a higher capacity to reflect light waves compared to white, which has the most reflecting power among colors. This is why pharmaceutical companies prefer white as the color of medicine, followed by red or orange, to ensure the quality of the medication is maintained and to protect against harmful effects. Wavelength ($\lambda$) is inversely proportional to the frequency (Ʊ) of light. The energy of red color radiation photons (hvr) is less than that of violet color radiation photons (hʋr).

**hv=hv0 + K.E.**

v0 is called the minimum energy of light Photon

Hv0 is the threshold i.e. minimum energy to knockout electron and K.E. is energy giving to electron; apply to all the radiation light infrared UV etc.

If the substance in the medicine is light-sensitive, photons may knock electrons from the surface, severely affecting the quality of the medicine. By ensuring the frequency of light radiation is above a certain threshold (v0), the quality of the medicine can be maintained. Rayleigh's law named after the British physicist Lord Rayleigh, states that the intensity of scattered light varies inversely as the fourth power of the wavelength.

**Scattered ∝1/ λ**

This means that shorter wavelengths, such as those in the visible spectrum, are more likely to be scattered. In contrast, infrared radiation, which has a longer wavelength than visible light, experiences almost no scattering In the realm of pharmaceuticals, the interaction of infrared radiation and light waves plays a crucial role in the quality and effectiveness of medicines. The longer wavelength of infrared radiation results in minimal scattering compared to light waves, giving priority to the power of infrared radiation in pharmaceutical applications.

| **Color** | **Wave length** | **Perception** |
|---|---|---|
| White | High reflectance; encompasses all wavelengths | Clean, pure, neutral |
| Blue | Short wavelength; calming, trustworthy | Cooling effect, may enhance stability of drug compounds |
| Green | Balanced wavelength; associated with nature, health | Relaxing, may aid in patient compliance |
| Yellow | Medium wavelength; cheerful, attention-grabbing | Energetic, may improve visibility and recognition |
| Red | Long wavelength; bold, stimulating | Attention-grabbing, may suggest urgency or strength |

Table 1: specific wavelengths of different colors and their impact on perception

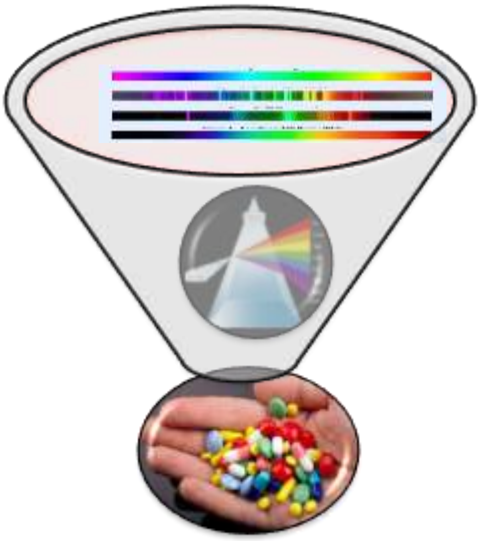
When medicines are transported to higher altitudes, they may be exposed to unknown or cosmic radiation, including gamma rays, X-rays, and cosmic radiation from space. While the intensity of these radiations decreases as they approach the Earth's surface, their impact at higher altitudes cannot be overlooked. The higher penetration power of alpha and gamma rays raises concerns about the quality of medicines during transportation.

The concept of stopping power comes into play when charged particles are absorbed by matter, defining the energy lost by the particle per unit length of path through the substance. By understanding the relationship between the range, energy, and stopping power of radiation, manufacturers can optimize the design of medicine strips and packaging materials to enhance their reflective properties. This approach ensures the maintenance of medicine quality by considering factors such as penetration power of radiation and stopping power of substances, and adjusting the thickness of packaging materials accordingly to provide effective protection against radiation exposure.

## 2. Conclusion:

The selection of white and other colors in tablet and drug manufacturing is not merely a matter of aesthetics but is deeply rooted in the scientific rationale of the wavelength of the spectrum. By understanding how different colors interact with light and how they can influence perception and efficacy, manufacturers can make informed decisions that optimize both the visual appeal and functional properties of pharmaceutical products. This scientific approach to color selection underscores the importance of considering not just what looks good, but what works best for the intended purpose.

## 3. Graphical Abstract



***Acknowledgement:***

Author is thankful to Dr. Devendra kishore for proper guidance and motivation regarding work

**References**

Khattak S.R., Ali H., Khan Y., Shah M. 2021, Color Psychology in Marketing. J. Bus. Tour.;4:183–190.

Gopikrishna R., Kumar M. A Conceptual Study on Psychology of Colour in Marketing and Branding. Int. J. Econ. Res. 2015;12:501–505.

Tao D., Wang T., Wang T., Qu X. Influence of drug colour on perceived drug effects and efficacy. Ergonomics. 2018;61:284–294. D

Stegemann S. Colored capsules—A contribution to drug safety. Pharm. Ind. 2005;67:1088–1095.