

Different Colourents Used In Hair Dyes

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ABSTRACT: An original hair color change by application of chemical dye is a common practice among the men and women. Hair dyes are classified into the following category based on their color retention property, namely temporary, semi-permanent and demi-permanent and permanent. Temporary dyes are otherwise called as non-oxidative dyes, because coloring process was carried out without any oxidizing agent, it reduced stay time on the fiber, removing the hair during the first shampoo wash. Semi-permanent products consist of nitro aromatic amines or aromatic amino nitroanthroquinone dyes, which diffuse into the hair and bind to the hair, however do not attach firmly. Permanent hair dyes are called oxidation hair dyes, because of the oxidizing agent used for the color development. An active intermediate reacts further with coupler and provides the color to the hair and in general oxidation hair dyes provides shampoo resistant hair dyes. Some hair dyes can cause allergic reactions or sensitization that may result in skin irritation and hair loss. People can develop sensitivities with repeated exposure. Also, formulations may change over time. The primary toxicological concerns of hair dyes, primarily oxidation hair dyes, are with contact dermatitis and long-term "potential" systemic effects. The paradiamine oxidation derivative dyes reported to having more sensitizing potential when compared to other amine derivatives. P-Phenylenediamine is the major component of oxidation hair dyes and oxidation dyes are the most widely used of all hair dyes. Therefore PPD is the sensitizer of prime concern.

I. INTRODUCTION

The use of cosmetics in order to change hair color, such as hair dye products, occurs with high frequency, mostly among the female

population [1]. However, these hair dyes, due to their action mechanisms, may cause serious damage to the hair fiber structure.

Throughout human history, many people have wished to change the appearance of their hair because it was a way to differentiate the social status. Hair dye has been used since Ancient Egyptian times when Rameses II rein forced red hair color using henna. In Ancient Greece, the hair was bleached with a rinse of potassium solution and rubbed with a type of ointment made of yellow flower petals and pollen. Nowadays, hair dyes are in an important phase of development and since the Second World War, great progress in discoveries and applications of new synthetic dyes has occurred.

Brazil is a country that, because of its high miscegenation, presents almost all the hair types. Furthermore, because of the great importance that women give to their hair treatments, Brazil is now the world leader in hair dye products. Nevertheless, the dye market has focused on exports, mainly to South American countries.

COLOURENTS

General factors

- Colorant experts have noted a wide variety of issues processors and compounders encounter when they attempt to match the color requirements for an application in a consistent, controllable manner. A handful of the main issues are explored briefly in paragraphs below, with as much specific attention to POs as possible. Then the following two subsections address more detailed issues with POs and colorants:
- Evaluating the color of the final product: As everyone familiar with the science of color agrees, color is subjective, and no two people will equally perceive the color of a final product. Even a single person's perception may be inconsistent over time. Spectrophotometers can help provide objective, repeatable Delta-E comparisons of

shade and hue, and allow processors and users to decide exactly “how close” a color should be to matching a standard. But a contoured colored product may still frustrate expectations that were based on a flat colored plaque or standard chip. The product and standard may also differ in terms of material, process, finish (matte vs. glossy), or even the samples’ physical dimensions; all of these affect the reliability of making comparisons and judging a color match (by either a human being or spectrophotometer’s computer).

- Moreover, judging coloration also depends on metamerism a phenomenon in which the color of an object shifts depending on the kind and/or angle of incident light. Two samples may appear to be the same color under one light source, but not under another; or shifting the angle of view of a sample surface may change the apparent color (a characteristic which or may not be desired, depending on the application). Thus a colored product sample should always be tested with the light source and conditions under which the product is most likely to be viewed .
- Organic vs. inorganic pigments: As regulatory changes tend to encourage users to steer away from heavy-metal-based inorganic pigments, more users encounter the limitations of organic pigment alternatives. Organic pigments provide stronger colors but can be less dispersible than inorganics in the resin. In particular, phthalocyanin green pigment particles can act as nucleators and cause uncontrolled resin crystallization, shrinkage, and war page. Classical organic pigments can also be more susceptible to weathering than inorganics and are less opaque (which may or may not be a desired property).

HISTORY

- Diodorus Siculus, a Greek historian, described in detail how Celtic people dyed their hair blonde: "Their aspect is terrifying... They are very tall in stature, with rippling muscles under clear white skin. Their hair is blond, but not naturally so: they bleach it, to this day, artificially, washing it in lime and combing it back from their foreheads. They look like wood-demons, their hair thick and shaggy like a horse's mane. Some of them are clean-shaven, but others—especially those of high rank—shave their cheeks but leave a moustache that covers the whole mouth..."

- The dyeing of hair is an ancient art that involves treatment of the hair with various chemical compounds. In ancient times, the dyes were obtained from plants
- Some of the most well known are henna (*Lawsonia inermis*), indigo, *Cassia obovata*, senna, turmeric and amla. Others include katam (*buxus dioica*), black walnut hulls, red ochre and leeks.
- In the 1661 book *Eighteen Books of the Secrets of Art & Nature*, various methods of coloring hair black, gold, green, red, yellow, and white are explained.
- The development of synthetic dyes for hair is traced to the 1860s discovery of the reactivity of para-phenylenediamine (PPD) with air.
- Eugène Schueller, the founder of L'Oréal, is recognized for creating the first synthetic hair dye in 1907.
- In 1947 the German cosmetics firm Schwarzkopf launched the first home color product, "Poly Color".
- Hair dyeing is now a multibillion-dollar industry that involves the use of both plant-derived and synthetic dyes.

HAIR COLOR TYPE

TEMPORARY HAIR COLOR

- Strands in shades of gray and pastels have been lighting up our social media feeds recently. While these on-trend hair colors certainly make for pretty pictures, not everyone is ready to keep such a bold look for the long term. This is where temporary hair color comes into play. Temporary hair dye, otherwise known as wash out hair color, coats only the outside of the hair shaft, so the results don't last. This means that when you go to shampoo your hair next, the new color will wash out and your hair will return to its natural shade, allowing you to experience a new hair color without a major commitment. However, you should know that damaged hair that's dyed with temporary hair color can appear stained after continued use over time.
- Have an out-there color you want to take for a spin? The L'Oréal Paris Colorista 1-Day Spray is a temporary hair color spray that you can wash out at the end of the day. Try one of the many fun shades available and take a new hue for a test drive. Another option is the L'Oréal Paris Colorista Hair Makeup 1-Day Color, which is another temporary hair color that washes out in just one shampoo and comes in

an array of colors. If you like to get super creative, hair makeup may be the route you should go, as you can mix multiple shades together for a custom color. So fun!

SEMI-PERMANENT HAIR DYE

- If you're ready to take that temporary look a little further, semi-permanent hair color will do just the trick. These dyes are generally not formulated with ammonia and don't require developing. What's better: Semi-permanent color generally lasts for around eight washes. For these reasons, an at-home semi-permanent dye can be a great option for gray hair coverage when you know you can't get to the salon right away.
- There are a myriad of benefits to using semi-permanent color, including that it can help add gloss and shine to dull-looking hair, it's great to use when growing out permanent color, and it can be used to help provide temporary root touch-ups. To reap those benefits, try the L'Oréal Paris Colorista Semi-Permanent Hair Color. The semi-permanent color fades in four to ten shampoos so you can try a trendy color and transform your style without committing to a new color for the long haul.

3] DEMI-PERMANENT HAIR DYE

- Want something in-between semi-permanent and permanent? Look no further than demi-permanent hair dye! This type of hair dye is similar to semi-permanent hair dye due to the fact that it isn't permanent and is ammonia-free, though there are some key differences between the two.
- Unlike semi-permanent color, demi-permanent hair dye is mixed with a developer, which allows it to penetrate the hair shaft rather than simply coat it. This means demi-permanent color generally lasts longer than the types of hair color we've covered thus far, up to 24 shampoos.

4] PERMANENT HAIR COLOR

- If you're looking to stick to one hair color for a while, permanent hair dye is probably the right option for you. This dye requires more complex chemical processing and will penetrate your hair more deeply. This means that your color can last for weeks without visible signs of fading.
- Permanent hair color can be used to help lighten, darken, or tone your hair and can help

provide high gray hair coverage.

- Despite its long-lasting benefits, permanent hair color will eventually have to be reapplied due to new hair growth. Also, depending on your base color and what you'd like to achieve, you may have to gradually color your hair to achieve your desired look. While it would be great to go from dark to platinum blonde in one sitting, slow and steady usually wins the permanent hair color race. Want a few permanent hair color recs? Take your pick from our best options below.
- L'Oréal Paris Superior Preference: This permanent hair dye will give you fade-defying color for up to eight weeks. The hair dye comes in over 50 luminous shades, giving you endless opportunities to change your look.
- L'Oréal Paris Féria: Say goodbye to dull, flat color and hello to multi-faceted shimmering color. With over 40 shades, this fashion-inspired hair dye will transform your mane. (Want a little help narrowing things down? Click through to our article, PSA: Check Out These Three Striking Shades of Féria Hair Color.)
- L'Oréal Paris Excellence Creme: Need a formula that will cover even the most stubborn grays? This hair dye is for you! There are over 30 beautiful shades to choose from that will leave you with rich, radiant color and 100% resistant gray coverage.

HIGHLIGHTS

- Not every look requires all-over color, which is where hair highlights come into play. These are achieved by placing the color on different segments of the hair to help promote depth, tone, and shade.
- The chunky-looking highlights of the past are no longer the biggest trend, now a more dimensional, subtle look has become the go-to way to help refresh tired locks. Instead of being limited to one type of highlights, there are quite a few you can choose from. These include:

HIGHLIGHT TYPE

• OMBRÉ

Ombre hair color leaves your natural color at the roots and gradually fades into a lighter highlighted tone at the bottom of the hair. Get the look at home by using the L'Oréal Paris Colorista Bleach Ombré Bleach.

• BALAYAGE

This highlighting technique involves painting on highlights where your hair naturally hits the light, helping to give your hair a more youthful, natural-looking glow. Since balayage involves strategic placement, this highlighting technique is best left to the pros.

• **LOWLIGHTS**

Instead of picking strands to lighten, this technique involves introducing darker tones to the hair for added dimension that's perfect for a seasonal hair update.

• **TEXTURED HIGHLIGHTS**

This style will incorporate different shades of highlights to create a multi-dimensional final look. To try it out for yourself, reach for the L'Oréal Paris Féria Multi-Faceted Highlights, which helps you achieve a multi-faceted spectrum of pure blonde highlights in one easy step.

ROOT COLOR

- For some people, gray hair can be the bane of their existence. In this case, you may not need or want a full color dye job, so a root touch up may be the best way to help maintain your natural color.
- The great news is that root concealer products can range from temporary to permanent, and there are plenty of new options to cover gray hair quickly and easily
- . One of our favorites is temporary root cover up spray, which is a great way to help conceal the appearance of gray roots. If you need a quick solution, these sprays distribute a fine-mist of color that washes out with your next shampoo. Temporary root concealers are not a great permanent solution—hence the name—but they are amazing for last-minute events and touch-ups.
- Sound like what you need? Try the L'Oréal Paris Magic Root Cover Up, which covers up gray roots in just seconds.
- For those times when you may be in a pinch and need an on-the-go option, we've got you covered there, too!

HAIR BLEACH

- If you have naturally dark brown or brunette hair, there is a good chance you'll need a hair color bleach to lighten your hair before dyeing it to a lighter shade or going blonde altogether. While bleach is a great way to lighten and brighten your hair, be aware that using it can lead to damage. Here are a few at-home bleaching kits to consider.

- L'Oréal Paris Colorista Bleach: This at-home bleaching kit can be used for all-over bleaching, ombré, or highlights.
- L'Oréal Paris Féria Extra Bleach Blonding: This bleaching kit is a one-step lightening system that's gentle and deeply conditions hair.
- L'Oréal Paris Super Blonde in Bleach Blonde: With super-lightening action, this bleach delivers smooth, even blonding from root to tip and lightens natural or color-treated hair in one simple step—even dark hair!

HENNA

- You're likely familiar with henna tattoos—you know, the ones you used to beg your parents for on the boardwalk during summer vacation. But henna isn't only used to adorn the skin with swirling designs, it's also used to color hair.
- Derived from the henna plant, henna hair dye typically gives hair a reddish hue, providing shine and color vibrancy in the process. Henna may be a good option if you've previously experienced an allergic reaction when dyeing your hair (don't forget to spot test!), as natural henna is usually hypoallergenic. Henna also may be beneficial for those with dandruff, so it could be worth a try if you're fed up with your itchy, flaky scalp.
- Now that you know all about the different types of hair dye, are you ready to try out a new look? We've got plenty of ideas! Here's How to Get Pink Lemonade Hair.

Pyrogallic:

- | Formula | Quantity for 100 g |
|---------------------------|--------------------|
| • Powdered henna (color) | 89 g |
| • Pyrogallic acid (color) | 6 g |
| • Copper sulphate (color) | 5 g |

Camomile: The flowers of camomile are used to obtain the colour. The flowers which contain the active principle are powdered. Its paste is made by mixing the powder with hot water and applied on the hair. A warm towel is wrapped over the head to enhance the colouring effect. The colour achieved is due to the navy blue volatile oil obtained in the process. Either 2 parts of kaolin or 1 part of fuller's earth is added to camomile powder to form a cohesive composition. Henna is mixed with camomile in varying proportions, to modify the colours.

- | Formula | Quantity for 100 g |
|---------|--------------------|
|---------|--------------------|

- Powdered camomile (color) 70 g 30 g
- Powdered henna (color) 30 g 70 g

TYPES OF HAIR DYES

1. Permanent hair dyes

Hair colored with permanent dyes would stay forever and does not get removed by washing. Permanent hair dyes work on the principle of oxidation. They contain 4 important components:

- Colourless dye precursors like PPD
- Oxidising agents like hydrogen peroxide (in 6% concentration)
- Ammonia
- Couplers

How do permanent hair dyes work?



Permanent hair dyes color the hair in two steps:

1. Remove the natural hair color
 2. Apply the new hair color
- The dye precursors (PPD) are small molecules that penetrate deep into the hair shaft. Ammonia, present in the dye, facilitates their entry. Once inside the hair shaft, hydrogen peroxide first bleaches the natural colour of hair. It then oxidises the dye precursors to deposit new colour.
 - How effective are permanent hair dyes?
 - Permanent dyes are the most effective ones when it comes to covering gray hair. They provide 100% grey coverage even on resistant grays. All hair get uniformly colored. This,

however, sometimes looks unnatural or too dark with dark shades. With permanent hair dyes, it is also possible to get a hair colour which is of an even lighter shade than natural hair. This is because the hair is initially bleached by hydrogen peroxide to let it take over new hair colour.

- Permanent hair dyes do not get washed off even with repeated shampooings. However, as new hair growth appears on the scalp, re-dyeing is necessary every 4 to 6 weeks.
- How to avoid reactions with permanent hair dyes?
- PPD derivatives are prone to cause allergic reactions. It is important to do a patch test before applying them. On a clean area just below your elbow or forearm, apply the dye mix with a cotton swab and allow it to dry. Look out for signs of a reaction, like redness, burning sensation, itching or any other discomfort. If there is no such reaction in 48 hours, the dye can be safely used on your scalp.

Some common permanent hair dyes:

- L'Oréal Excellence Creme hair color
- Bigen Easy 'n Natural Hair Color
- Garnier Color Naturals Nourishing Permanent Hair Color Cream
- Revlon ColorSilk
- Revlon Colorsilk Luminista
- L'Oréal INOA
- Wella Kolestint

FORMULATION OF PERMANENT HAIR DYES

Following are the main factors which have to be considered in developing suitable formulations:

- The formulation base like solution, emulsion, gel, shampoo or powder.
- The selection of the dye components i.e. the oxidation base, the coupling agent or the addition of a direct colourant.
- The selection of an alkali, usually ammonia is used.
- Antioxidants: Usually a Sulphite, Ammonium thioglycollate or ascorbic acid is used to prevent oxidation of the dye before the product is to be used.
- The pack: Required to be attractive and convenient in use.

The most convenient medium for colouring the hair is a shampoo. The system consists of the dye precursors together with an

ammonium foliate soap or other surfactant, to which is added at the time of use another solution of stabilized hydrogen peroxide contained in a separate vessel. This mixture is applied direct to the hair and left in contact for 20-40 Mins. Afterwards the hair is rinsed with water and then washed again. By use of various other additives such as fatty alcohol sulphates, fatty acid dialkanolamides, nonionic or amphoteric surfactants, fatty alcohols amine oxides, fatty amines and cationic surfactants a whole range of emulsion can be formulated in order to produce the dyes in the forms of creams, gels, shampoo etc.

2. Demi-permanent dyes

- These are chemically milder as compared to permanent hair dyes. This is because they **do not contain ammonia**. Also, they have **lower concentrations of hydrogen peroxide** (2% as compared to 6% in permanent dyes). The color molecules of demi-permanent hair dyes get deposited on the cuticle as well as penetrate into the hair cortex.

How effective are demi-permanent hair dyes?



- As demi-permanent hair dyes cannot bleach the hair pigment that's already there. This is because they contain less amount of hydrogen peroxide. In other words, **demi permanent hair dyes cannot lighten the pre-existing color of your hair**. You can only go for either a similar or a darker shade than your present

hair colour. The colour is developed and deposited just like permanent hair dyes, but is washed out in 12 to 28 shampoo washes.

Are demi-permanent hair dyes better than permanent hair dyes?

- If you have up to 50% grays and want to stay close to natural hair colour, you can use demi-permanent hair dyes. The colour imparted by these dyes is not as uniform as that with permanent hair colours. So, new hair growth from roots does not look as prominent and contrasting as in case of permanent hair colour. Hence, **demi-permanent dyes give a more natural color to your hair**. These are **gentler than permanent hair dyes**, as these are less damaging to the hair shaft and less irritant to the scalp. Individuals with damaged and fragile hair can use these dyes to cover grays.

How to avoid reactions with demi-permanent hair dyes?

- Just like permanent dyes, they contain PPD. As we already told you, PPD derivatives are **prone to cause allergic reactions**. Hence, the use of demi permanent dyes also requires a **patch test**, as described above in the permanent hair dye section.

Some common demi-permanent hair dyes:

- L'Oreal Casting Crème Gloss
- L'Oreal Healthy look crème gloss
- L'Oreal Color Gems Hair color
- Bigen Powder Hair color
- Just for Men Natural Hair Color
- Streak Hair Color
- Garnier Nutrisse Hair Color
- Clairol Natural Instincts Hair Color

3. Semi permanent dyes

- Semi permanent dyes **contain neither ammonia nor hydrogen peroxide**. The color molecules of semi permanent dyes do not penetrate into the cortex of the hair. They just get deposited on and in the cuticle (outermost layer of the hair).
- Semi-permanent hair dyes can be either synthetic or natural.
- **Synthetic semi-permanent dyes** are pre-formed dyes that contain nitro amines or nitro benzenes. Some common synthetic semi-

permanent hair dyes include Garnier Herbal Shine & Ion Color Brilliance Bright Semi-Permanent Hair Color.

- Amongst **natural semi-permanent hair dyes**, Henna (or **mehndi**) is the commonest. We will discuss mehndi in detail in our coming article.
- **Indigo** is another natural hair dye that is available as a green powder. When mixed with mehndi, the colour results are superior.



- **Vegetal Bio colour** is a dermatologist-prescribed semi-permanent hair dye available in India. This is a combination of natural dyes as henna, indigo, catechu, coffee and manjistha.
- **How effective are semi-permanent hair dyes?**
- Being chemically milder, they are suitable for fragile and damaged hair. But these dyes have limited results. They can only blend up to 30% of grays. The colour gets washed off in 4 to 8 shampoo washes. Also, semi-permanent dyes can only darken your natural hair shade, and not lighten it.
- Unlike permanent & demi-permanent dyes, they do not contain PPD. Thus, **semi-permanent dyes usually don't cause allergic reactions**. Thus, A patch test is not essential before the use of these dyes.

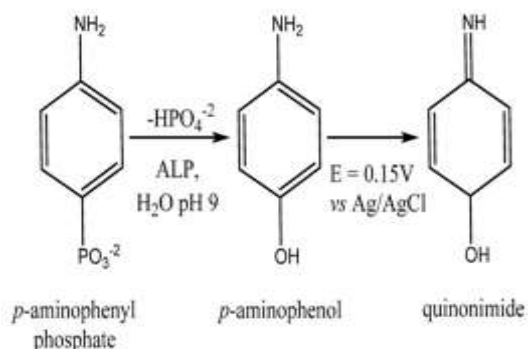
4. Gradual hair dyes

- These are aqueous solution of metals, which when applied on hair, leave back dark shade of metal oxides or sulphides. Such metallic dyes **need repeated application over a period of weeks**. With each application, one can observe the gradual darkening of hair colour from grey to yellow brown to burgundy. The colour **easily fades off by shampooing**. Hence, gradual hair dyes need constant application. Hair perming or straightening procedures shouldn't be done on hair coloured with metallic dyes.
- **Are gradual hair dyes better than the permanent ones?**
- These metallic hair dyes don't contain PPD. Hence these dyes are **useful for individuals allergic to PPD-containing dyes**. Their use doesn't need a patch test.

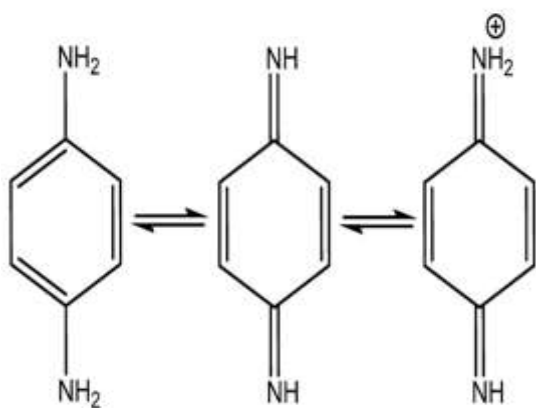


5. Temporary hair dyes (ideally called hair colors)

Temporary dyes consist of compounds having large sized molecules (larger than semi permanent dyes). Due to their large size, **the colour does not penetrate the hair shaft**. Instead, the color just sits outside the hair shaft, very close to the hair surface. Such a color can be **washed out within one shampooing**. But, on poor quality porous hair, even temporary dyes may get absorbed deeper, and may stay longer.



- Structural formula of p-phenylenediamine (PPD).
- INCI name: phenylenodiamine.
- CAS No. 106-50-3.
- EINECS No. 203-404-7.
- Formula: C₆H₈N₂.
- Chemical classification: aromatic amine [23]
- Legend: INCI,
- International Nomenclature of Cosmetic Ingredients;
- CAS, Chemical Abstract Service.



Structural formula of p-aminophenol (PAP)

- INCI name: p-aminophenol.
- CAS No. 123-30-8.
- EINECS No. 204-616-2.
- Formula: C₆H₇NO.
- Chemical classification:
- substitute phenol [23]



TEMPORARY HAIR DYES

Powder Formulations:

They are mostly used in theoretical make up and masquerades. The powder consists of dye stuff and acid like citric acid or tartaric acid. They are available in sachets.

- Formula Quantity for 100 g
- Certified color 5 g
- Tartaric acid (buffer) 95 g

Application Technique: The powder is dissolved in 250 ml of water and this solution is applied on wet hair after shampooing.

(b) Crayon Formulations: These temporary hair colorants are applied between the applications of permanent hair colorants. They color the new growing hair. They are available in many shades of colors. The composition of crayon is soap, waxes, dyes or pigments.

- Formula-1 Quantity for 100 g
- Stearic acid (anionic surfactant) 15 g
- Triethanolamine (surfactant) 7 g
- Beeswax (wax) 50 g
- Carnauba wax(wax) 13 g
- Ozokerite (wax) 7 g
- Glyceryl mono stearate (surfactant) 6 g
- Tragacanth (gum) 2 g
- Color q. s

Method:

- Triethanolamine, glycerol monostearate and tragacanth are heated to 70°C.
- Stearic acid is incorporated in the above mixture and the mixture is heated to 75°C.

- Beeswax and carnauba wax are melted separately at 70--80°C.
- The molten waxes are added to the above mixture and stirred well.
- Color is added and the mixture is stirred well.
- This mixture is then poured into the moulds.

Formula-2

- Quantity for 100 g
- Sodium stearate (thickener) 18 g
- Gum Arabica (gum) 25 g
- Glycerin (surfactant) 15 g
- Color 17 g
- Water (solvent) 25 g

Method:

- A mixture of water and glycerin is prepared and divided into twoparts.
- Gum Arabica is added to one portion.
- Sodium stearate is added to the other portion and ii is dissolved bwarming.
- Both the portions are mixed and colour is added.
- This mixture is milled to form a paste.
- The paste is introduced into moulds and allowed to dry with the helpof heat.

Application Technique: It may be applied in one of the two ways.

1. The crayons are rubbed over the hair, (or)
2. It is applied using a brush.

Colour Shampoos:

They develop a temporary tinge of colour. The base used in the preparation consists sulphonated oils, anionic or non-ionic surfactants. They are available in only few colour shades.

Formula Quantity for 100 g

- Ammonium lauryl alcohol sulphate (surfactant) 30 g
- Coco diethanolamide (pearlescent stabilizer) 2 g
- Water (solvent) To make up to 100 g

Water Rinses:

- 1 The water rinses are acidic in nature, thus
 - (a) Prevents the degradation of hair by alkali.
 - (b) Gives pastel shades to bleached hair.
 - (c) Auburn (reddish brown), blue, blonde, pink colours may be obtained.
2. The water used in water rinses must be deionized or distilled water, otherwise. The

colours of the colourants get changed by the metal ions present in water.

3. EDTA, sequestering agent is included in water rinses.
4. A compatibility is observed between dye and acid which is responsible for imparting particular colour. That is why appropriate acid is used with a particular dye.
5. Solutions of basic dyes like Methylene blue, gentian violet and rhodamine gives pastel shades.

6 Bleaching mixture is added to solution of dye to minimize deep red and yellow colours but to obtain white or platinum blonde colours.

7. The dye stuff when added to a detergent base shampoo, exerts similar action as that of water rinses. It is prepared in the following manner.

- Dye is mixed with water to form a solution.
- The above solution is added to shampoo detergent base like triethanolamine lauryl sulfate.
- The pH of the above mixture is adjusted to 5.

Formula for water rinses or rinse solution is given below:

Formula Quantity for 100 g

- Acid dyestuff (color) 6 g
- Alcohol (antiseptic) 10 g
- 30% acetic acid (buffer) 10g
- Water (solvent) 74 g

Pyrogallic acid added to henna, gives darker shades.

Formula Quantity for 100 g

- Powdered henna (color) 89
- Pyrogallic acid (color) 6 g
- Copper sulphate (color) 5 g

- (a) Camomile: The flowers of camomile are used to obtain the color. The flowers which contain the active principle are powdered. Its paste is made by mixing the powder with hot water and applied on the hair. A warmtowel is wrapped over the head to enhance the colouring effect. The colour achieved is due to the navy blue volatile oil obtained in the process. Either 2parts of kaolin or 1 1 part of fuller's earth is added to camomile powder to form a cohesive composition. Henna is mixed with camomole in varying proportions, to modify the colours.

Quantity for 100 g

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- Alcohol (antiseptic) 10 g
- 30% acetic acid (buffer) 10g
- Water (solvent) 74 g

SEVEN HAIR COLOURING TECHNIQUES**• Balayage**

This popular technique creates super-soft, sun-kissed colours throughout the hair. It is achieved by leaving natural colour in between lighter pieces and back-combing the coloured pieces to soften any lines. It can also be done by painting diagonal sections of the hair and leaving sections in between completely natural. Balayage is a low-maintenance, 'lived-in' style that's pretty subtle, but can be built up over time – perfect when you're ready to hit refresh but don't want a colour overhaul. It works on most hair types and colours.

• Wet-Lights

This is ideal for those wanting to soften and break up a harsh hairline or fluffy re growth. Wet-lights are painted free hand on to wet hair, creating a halo of light that brightens up the overall colour. They're 50% healthier and quicker than alternative colour treatments too because they're applied wet, when the cuticles are open, which restricts extreme damage, leaving hair stronger, smoother and healthier-looking in half the time. Wet-lights are particularly good for those with over-processed bleach or brassy blonde hair.

• Ombré

Ombré melts darker roots into brighter ends. It's a lot more obvious than balayage because there is no definition of natural colour through the ends. Rather than picking pieces and leaving natural shade in between, you pick up every strand of hair and colour the mid-lengths to the ends. Always make sure your stylist has blended the colour consistently and thoroughly because, if not, it will look like a dip-dye job.

• Highlights

Highlights are old-school, but they still reign supreme. Stylists apply them in a weaving technique, placing colour directly onto the root. The hair is then neatly folded into foils and placed under heat, which encourages the foil to lift the hair to its desired, natural potential. Depending on the thickness of your hair, you can have chunky highlights or baby fine highlights, which are created by leaving sections of your natural hue in

between each strand of new colour.

• Lowlights

This colour lightening technique always includes a natural base tone. Lowlights are used throughout the mid-lengths to add definition to the ends, achieving a 'shadow' effect while breaking up any blockiness from highlights. Lowlights reduce the need for colour maintenance because they soften the re growth with the application of your own natural colour throughout. Ideal for anyone who wants just a subtle difference that catches the light.

• Permanent Colour

Put simply, permanent colour is one that doesn't fade when you shampoo and won't leave the hair cuticle. It is usually for clients that have more than 70% grey hair or stubborn grey hairs that won't take a semi-permanent option. If clients have fine hair or only a few grey hairs, permanent colour can become harsh to your hair and scalp, and start to look unnatural over time. In those cases, semi-permanent colour is preferable.

• Reverse Balayage

This is for those with ombré hair who are looking for a more natural, broken-up colour. It is also for clients who have had over-processed balayage, where repeated application of colour to the same hair strands has left them with an ombré style.

THE MANUFACTURING PROCESS**• Checking ingredients**

1 Before a batch of hair dye is made, the ingredients must be certified. That is, the chemicals must be tested to make sure they are what they are labeled, and that they are the proper potency. Certification may be done by the manufacturer in-house. In many cases, the ingredients arrive from a reputable distributor who has provided a Certificate of Analysis, and this satisfies the manufacturer's requirements.

• Weighing

2 Next a worker weighs out the ingredients for the batch. For some ingredients, only a small amount is necessary in the batch. But if a very large batch is being made, and several ingredients are needed in large amounts, these may be piped in from storage tanks.

- **Pre-mixing**
- 3 In some hair dye formulas, the dye chemicals are pre-mixed in hot water. The dye chemicals are dumped in a tank, and water which has been already heated to 158°F(70°C) is pumped in. Other ingredients or solvents may also be added to the pre-mix. The pre-mix is agitated for approximately 20 minutes.

- **Mixing**
- 4 The pre-mix is then added to a larger tank, containing the other ingredients of the hair dye. In a small batch, the tanks used may hold about 1,600 lbs (725 kg), and they are portable. A worker wheels the pre-mix tank to the second mix tank and pours the ingredients in. For a very large batch, the tanks may hold 10 times as much as the portable tanks, and in this case they are connected by pipes.



- **Hair Dye**
- In a formula in which no pre-mixing is required, after checking and weighing, the ingredients go directly to the mixing step. The ingredients are simply mixed in the tank until the proper consistency is reached.
 - If a heated pre-mix is used, the second mix solution must be allowed to cool. The ingredients that follow the pre-mix may be additional solvents, surfactants, and alkalis. If the formula includes alcohol, it is not added until the mix reaches 104°F(40°C), so that it does not evaporate. Fragrances too are often added at the end of the mix.

- **Filling**
- The finished batch of hair dye is then piped or delivered to a tank in the filling area. A nozzle from this tank lets a measured amount of hair dye into bottles, moving beneath it on a belt. The filled bottles continue on the belt to machines, which affix labels and cap them.

- 5 **Packaging**
- From the filling area, the bottles are taken to the packaging line. At the packaging line, the hair dye bottle is put in a box, together with any other elements such as a bottle of developer or special finishing shampoo, instruction sheet, and gloves and cap, or any other tools provided for the consumer. After the package is complete, it is put in a shipping carton. The full cartons are then taken to the warehouse to await distribution.

- **Quality Control**
- Government regulations control what ingredients may be used in hair dyes, as many of them are toxic. Industry researchers will have already tested a formula numerous times in the laboratory before it reaches the manufacturing stage, to make sure a formula is non-irritating, works well, performs consistently, etc. As part of the manufacturing process, workers check their chemicals before they go into a batch, to make sure only the correct chemicals at the correct potency are used. After the batch is mixed, samples are taken, and these are subjected to a series of standard tests. Lab technicians make sure that the batch is the required viscosity and pH balance, and they will also test the dye's action on a swatch of hair. If a hair dye formula is being made for the first time, or if a formula has been altered, technicians will also test samples of the dye after the filling stage.

- **The Future**
- Hair dye manufacturers are increasing their use of computers to control and automate the manufacturing process. Computers can be used to weigh and measure ingredients, to control reactions, and to regulate equipment such as pumps. The future may see more fully automated manufacturers and increased efficiency.

SIDE EFFECTS OF USING HAIR DYES:

- **Overexposure**
- Permanent hair dyes contain ammonia and peroxide. Peroxide strips away the natural color of hair and thus exposing your hair to

these chemicals regularly can cause your hair to lose luster, break easily and even lead to eventual hair fall.

○ Allergic reactions

Dyes contain paraphenyldiamine which is an allergen. By this, people who have dermatitis can have a severe reaction. People with eczema and psoriasis should avoid hair dyes. Not only this, but can also cause itching, skin irritation, redness, and swelling.

■ Effect on Pregnancy

Colouring hair can prove to be fatal for the unborn infant of pregnant women as it may cause malignancy.

■ Asthma

Hair dyes contain per sulfates which can aggravate asthma. Continuous inhalation of the chemicals can cause coughing, lung inflammation and even asthma attacks.

Adverse effects

- Hair coloring involves the use of chemicals capable of removing, replacing, and/or covering up pigments naturally found inside the hair shaft.
- Use of these chemicals can result in a range of adverse effects, including temporary skin irritation and allergy, hair breakage, skin discoloration and unexpected hair color results.
- According to the International Agency for Research on Cancer (IARC), in vitro and in vivo studies (in exposed human populations) have shown that some hair dyes and many chemicals used in the hair dyeing process can be considered mutagenic and carcinogenic.

1. Skin irritation and allergy

In certain individuals, the use of hair coloring can result in allergic reactions and/or skin irritation. Individuals allergic to gluten for example, will need to be cautious when purchasing hair color since certain hair dye includes gluten. Gluten does not need to be ingested for it to cause an allergy. Skin contact with gluten may cause a reaction; therefore, leading to an allergy. Symptoms of these reactions can include redness, sores, itching, burning sensation and discomfort. Symptoms will sometimes not be apparent immediately following the application and processing of the tint, but can also arise after hours or even a day later.

2. Skin discoloration

Skin and fingernails are made of a similar type of keratinized protein as hair. That means that drips, slips and extra hair tint around the hairline can result in patches of discolored skin. This is more common with darker hair colors and persons with dry absorbent skin. That is why it is recommended that latex or nitrile gloves be worn to protect the hands.

3. Health concerns

The salt lead acetate (the active ingredient in gradual darkening products such as Grecian formula) is toxic. Lead acetate trihydrate has also been shown to cause reproductive toxicity.

II. CONCLUSION

- We concluded that the berries give the most effective hair dye. This is probably due to the intensity and concentration of their colorant.
- The intensity of their colorant is due to the phytochemicals present in the fruits. The most effective phytochemicals are anthocyanins.
- Carotenoids and cyanins also provide the pigments in fruits but are not as effective as anthocyanins. Hibiscus also gave an effective hair dye because they have anthocyanin present in their flower.
- Citrus fruits gave the least effective hair dyes. The reason is that citric acids do not particularly have a solid color.
- Their dye is translucent, and their composition is also different than the composition of the berries.
- They have a composition that is mostly composed of water, so this means that it has a lower concentration of coloring, thus causing it to have an ineffective dye.
- Citrus fruits do not contain the phytochemical anthocyanin, this is probably the main reason why their pigment is not as strong as that of hibiscus, the teas, and berries.

III. RESULT :

Among the various options of hair dyes, it is interesting to know the application features and their affinity for the hair fibers in order to select the best option for each hair type and to provide a satisfactory effect, as a good covering power of gray/white hair, good color resistance to shampoo washes, and high durability of color. The challenge is to find options that provide security in the application and allow these benefits to occur without generating very aggressive damage to the hair strands.

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