International Journal of Research and Review
[Indexed, Peer-Reviewed Journal]
Volume 12; Issue: 8; August 2025
Website: www.ijrrjournal.com
Research Paper *E-ISSN: 2349-9788; P-ISSN: 2454-2237*

Comparative Evaluation of Stain Removal Efficacy of Commercially Available Chemical Denture Cleansers with Natural Denture Cleansers on Heat Cured Acrylic Denture Base Resins: An In Vitro Study

Amatullah Sadiya[1], Veerendra Prasad[2], Pawan Kumar[3], Sri Harsha Pudi[4], Swathi Nallabapani[5], Punyakeerthi[6]

[1]Post Graduate, Department of Prosthodontics, MNR Dental College and Hospital, Sangareddy, Telangana, India.
[2]Professor, Department of Prosthodontics, MNR Dental College and Hospital, Sangareddy, Telangana, India.
[3]Professor and Head, Department of Prosthodontics, MNR Dental College and Hospital, Sangareddy, Telangana, India.
[4]Associate Professor, Department of Prosthodontics, MNR Dental College and Hospital, Sangareddy, Telangana, India.
[5]Assistant Professor, Department of Prosthodontics, MNR Dental College and Hospital, Sangareddy, Telangana, India.
[6]Post Graduate, Department of Prosthodontics, MNR Dental College and Hospital, Sangareddy, Telangana, India.

Corresponding Author: Veerendra Prasad.

DOI: https://doi.org/10.52403/ijrr.20250824

ABSTRACT

Background: Denture staining compromises esthetics and hygiene. While chemical denture cleansers are widely used, natural alternatives are gaining attention for their biocompatibility and availability.

Aim: To compare and evaluate the stain removal efficacy of commercially available chemical denture cleansers (Clinsodent and VI Clean) with natural denture cleansers (lemon juice and aloe vera) on heat-cured acrylic denture base resins.

Materials and Methods: 150 heat-cured acrylic resin specimens were fabricated and stained using tea, coffee, and turmeric. These were divided into subgroups and treated with one of the five solutions: Clinsodent, VI Clean, lemon juice, aloe vera, or distilled water (control) over 3 months. Optical density (OD) at λmax was measured using a UV-Vis spectrophotometer before staining, after staining, and post-cleaning.

Results: Clinsodent showed the greatest stain removal efficacy for tea and coffee stains, while VI Clean performed best against turmeric stains. Natural cleansers, especially aloe vera, showed lower efficacy, with distilled water outperforming it in some cases.

Conclusion: Commercially available denture cleansers were more effective than natural alternatives in removing stains from heat-cured acrylic dentures. Natural products like lemon juice showed moderate effectiveness and could be considered as adjunctive or alternative options in select cases.

Keywords: Denture cleansers, Stain removal, Heat-cured acrylic resin, Citric acid, Aloe vera, Optical density.

INTRODUCTION

Denture hygiene is essential for oral health, especially with heat-cured PMMA acrylic resins commonly used for their affordability, biocompatibility, and aesthetics. However, like natural teeth, dentures are prone to stains, plaque, and biofilms from daily exposure, leading to discoloration, bad breath, and mucosal irritation. [1]

Denture staining is a common issue for wearers, caused by dietary sources (e.g., tea, coffee) and habits like smoking. The surface roughness and porosity of PMMA resins allow deep penetration of stains, making them harder to remove with regular cleaning. [2] Inadequate or irregular cleaning of dentures allows plaque and microbial biofilms to develop, further contributing to staining. [3] Certain staining agents are more intense than others. This staining susceptibility depends on the amount and rate of stain and ability of the patient to remove it by the restorative appliances. [4]

Chemical denture cleansers are widely marketed and used for their effectiveness in plaque and stain removal. These include products based on alkaline peroxides, hypochlorite, acids, enzymes, and surfactants. [5] Peroxide-based cleansers release oxygen to produce mechanical bubbling that aids in dislodging stains, while sodium hypochlorite solutions act as strong disinfectants. A number of studies assessed sodium hypochlorite as a disinfecting agent for dental clinics and laboratories. [6] Chemical composition and aqueous chemistry of cleanser materials and solutions are vitally important in defining their cleaning ability and degradation effects on prostheses. [7] Despite their proven efficacy, prolonged use of chemical cleansers may negatively affect the colour stability, surface texture, and dimensional accuracy of acrylic resins.

Amid concerns over chemical exposure and sustainability, natural denture cleansers like baking soda, lemon juice, aloe vera, and vinegar are gaining popularity. Baking soda offers mild abrasiveness for stain removal, while vinegar provides antibacterial benefits. [8] These agents are typically non-toxic, readily available, and free from synthetic additives. More studies are required to evaluate the long-term effects of these natural-based products as denture cleansers. [9]

With growing interest in natural dental care products, this study compares the stain removal efficacy of chemical and natural denture cleansers on heat-cured acrylic resins. The aim is to identify the most effective and biocompatible option for maintaining denture hygiene while preserving material integrity, providing guidance for safer and more sustainable denture care.

MATERIALS & METHODS

Study Design:

In vitro experimental study.

Materials used

1. Dental modelling wax (Dental products of India Ltd.)
2. Model plaster (Kalrock, Kalabhai Karson Pvt Ltd, Mumbai)
3. Dental stone (Kalrock, Kalabhai Karson Pvt Ltd, Mumbai)
4. Heat cure acrylic resin (Dental products of India Ltd.)
5. Three different staining agents:

A. Brooke Bond Red Label Tea (Hindustan Unilever Ltd, India)
B. Bru Instant Coffee (Hindustan Unilever Ltd, India)
C. Swastik Turmeric Powder (Shree Swastik Food Products, India)

6. Two commercially available chemical denture cleansers:

A. Clinsodent powder (ICPA Health Products Ltd., Ankleshwar).
B. VI-clean denture cleanser liquid (Vishal Pharma Ltd., Ahmedabad)

A. Two Natural based cleansers: Lemon (Citric acid)

B. Aloe vera
7. Distilled water (VITSZEE Chemicals & Fertilizers, India)

Equipment used:

1. Spectrophotometer, i.e. Thermo Spectronic 10 UV from Genesys (UV-VIS), (Spectronic Unicam, Pittsford, New York, 2003).
2. Julabo SW1 Incubator (Julabo GmbH, Switzerland) for maintaining temperature at 37 ± 1°C.

Specimen Preparation:

Dental modelling wax (DPI) is melted and poured in a standard brass mould of length 50 mm, thickness 2 mm and width of 10 mm (ADA specification no.12). After the wax hardens, they are flasked according to the conventional technique and dewaxing is carried out. The mould cavities thus obtained are used for the fabrication of acrylic resin specimens. Acrylic resin (DPI) is packed and trial closures are done. These samples are bench cured for 30 minutes and then subjected to a curing cycle of one and half hours. The samples are then deflasked, trimmed and polished finally ensuring that the dimensions of 50 × 10 × 2 mm are maintained.

A total of 150 PMMA specimens (50 × 10 × 2 mm) were fabricated. (Fig. 1)

The baseline optical density of each of the unstained samples is determined prior to staining for future comparison.

Fig 1: DPI Heat Cure Acrylic Resin Samples

Optical Density Measurement:

Optical density (OD) is a measure of how much a substance absorbs light. It quantifies the reduction in light intensity as it passes through a material, such as a liquid sample or a filter. To calculate optical density (OD) using λ max (the wavelength at which a substance absorbs the lightest), Beer-Lambert Law, which relates absorbance (optical density) to concentration is used.

Beer-Lambert Law:

$OD = A_{\lambda max} \times l$

Where:

OD = Optical Density

$A_{\lambda max}$ = wavelength at maximum absorbance

L = Thickness of the PMMA sheet or film (in cm or mm)

UV-Vis spectrophotometer (fig. 2) scans the absorbance spectrum and identifies the peak absorbance wavelength.

Figure 2: Spectrophotometer

Staining Procedure:

The study employed tea, coffee and turmeric as staining agents. The tea solution was prepared by measuring 15 grams of tea powder on a weighing scale and pouring it in 250 ml of water. The coffee solution was prepared by measuring 15 grams of coffee powder on a weighing scale and pouring it in 250 ml of water. The turmeric solution was prepared by measuring 0.5 grams of turmeric powder on a weighing scale and pouring it in 250 ml of water.

Samples were immersed in aqueous solutions of tea, coffee, and turmeric (50 each) for 1 month at 37 ± 1°C to simulate oral conditions.

Group A: 50 samples suspended in aqueous solution of Tea
Group B: 50 samples suspended in aqueous solution of Coffee
Group C: 50 samples suspended in aqueous solution of Turmeric

Preparation of Denture Cleanser Solutions

- Clinsodent: 1 tsp powder in 100 ml water
- VI Clean: 1 tsp liquid in 100 ml water (fig. 3)
- Lemon Juice: 10 ml in 100 ml water
- Aloe Vera: 10 ml in 100 ml water
- Control: 100 ml distilled water (fig. 4)

Figure 3: Chemical denture cleansers

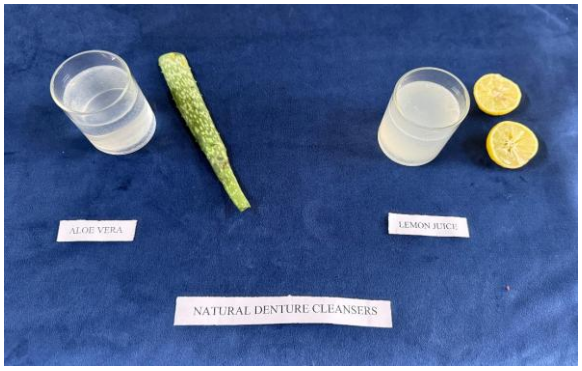


Figure 4: Natural denture cleansers

Subgrouping of Acrylic Resin Samples

- Stained samples were divided into subgroups and immersed in cleansers for 3 months:
- Tea-stained: A1 (Clinsodent), A2 (VI Clean), A3 (Lemon), A4 (Aloe Vera), A5 (Control)
- Coffee-stained: B1 (Clinsodent), B2 (VI Clean), B3 (Lemon), B4 (Aloe Vera), B5 (Control)
- Turmeric-stained: C1 (Clinsodent), C2 (VI Clean), C3 (Lemon), C4 (Aloe Vera), C5 (Control)

Treatment Protocol:

Specimens were immersed in their respective cleanser solution for 3 months. Fresh solutions were prepared regularly.

Optical Density Measurement:

OD was measured using a UV-Vis spectrophotometer at λmax specific to each stain before staining, after staining, and post-treatment.

STATISTICAL ANALYSIS

Data were analyzed using ANOVA and paired t-tests. A P-value <0.05 was considered statistically significant.

RESULT

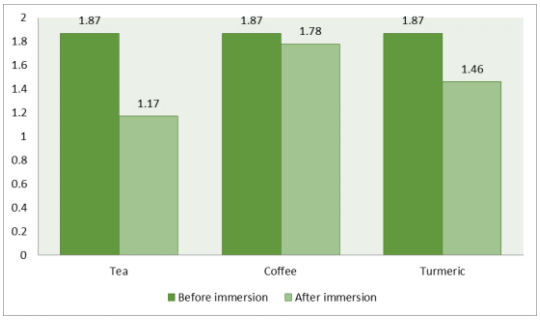
The mean baseline optical density values of the stained samples, after the spectrophotometric analysis at their respective λmax is determined and compared with optical density before staining of samples.

TABLE 1: OPTICAL DENSITY OF HEAT CURED ACRYLIC DENTURES BEFORE AND AFTER IMMERSION IN STAINING AGENTS

Staining agents	Before immersion		After immersion		P-Value¶
	Mean	SD	Mean	SD	
Tea	1.87	0.018	1.17	0.009	<0.001
Coffee	1.87	0.017	1.78	0.009	<0.001
Turmeric	1.87	0.020	1.46	0.005	<0.001
P-Value	0.084		<0.001		-

¶ Paired t test; ANOVA; P≤0.05 is statistically significant

GRAPH 1: OPTICAL DENSITY OF HEAT CURED ACRYLIC DENTURES BEFORE AND AFTER IMMERSION IN STAINING AGENTS



Tea caused the most significant drop in optical density, from 1.87 ± 0.018 to 1.17 ± 0.009 ($p < 0.001$), indicating the highest staining. Turmeric also showed a notable decrease (1.87 ± 0.020 to 1.46 ± 0.005), while coffee had the least change (1.87 ± 0.017 to 1.78 ± 0.009), though still significant.

TABLE 2: EFFICACY OF CLEANSING AGENTS IN STAIN REMOVAL OF TEA IMMERSED HEAT CURED ACRYLIC DENTURES

Cleansing agents		Mean	SD	P-value
Commercial	Clinsodent	1.14	0.003	<0.001
	VI Clean	1.15	0.003	
Natural	Lemon Juice	1.19	0.003	
	Aloe vera	1.17	0.003	
Control	Distilled water	1.16	0.003	

ANOVA; P≤0.05 is statistically significant

GRAPH 2: EFFICACY OF CLEANSING AGENTS IN STAIN REMOVAL OF TEA IMMERSED HEAT CURED ACRYLIC DENTURES

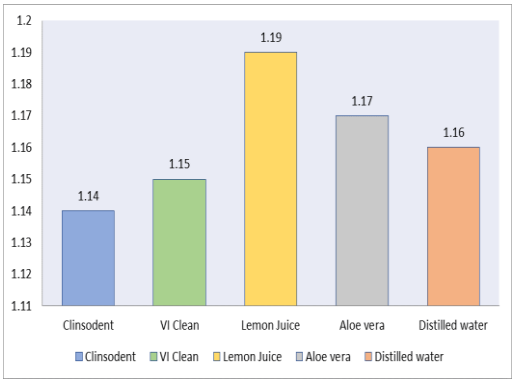


TABLE 3: EFFICACY OF CLEANSING AGENTS IN STAIN REMOVAL OF COFFEE IMMERSED HEAT CURED ACRYLIC DENTURES

Cleansing agents		Mean	SD	P-value
Commercial	Clinsodent	1.62	0.002	<0.001
	VI Clean	1.65	0.002	
Natural	Lemon Juice	1.77	0.003	
	Aloe vera	1.84	0.003	
Control	Distilled water	1.73	0.003	

ANOVA; P≤0.05 is statistically significant

GRAPH 3: EFFICACY OF CLEANSING AGENTS IN STAIN REMOVAL OF COFFEE IMMERSED HEAT CURED ACRYLIC DENTURES

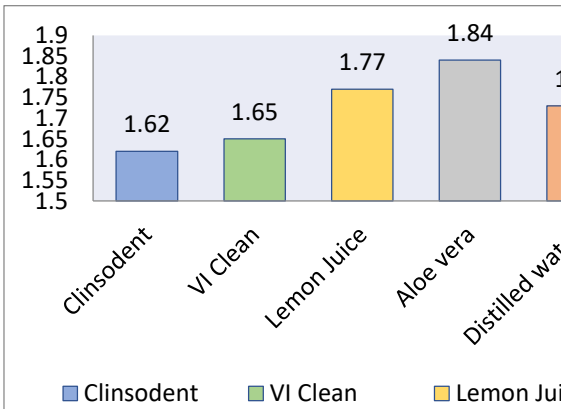
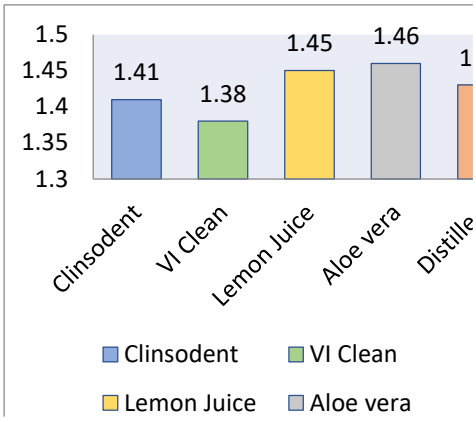


TABLE 4: EFFICACY OF CLEANSING AGENTS IN STAIN REMOVAL OF TURMERIC IMMERSED HEAT CURED ACRYLIC DENTURES

Cleansing agents		Mean	SD	P-value
Commercial	Clinsodent	1.41	0.003	<0.001
	VI Clean	1.38	0.003	
Natural	Lemon Juice	1.45	0.003	
	Aloe vera	1.46	0.002	
Control	Distilled water	1.43	0.003	

ANOVA; P≤0.05 is statistically significant

GRAPH 4: EFFICACY OF CLEANSING AGENTS IN STAIN REMOVAL OF TURMERIC IMMERSED HEAT CURED ACRYLIC DENTURES



Post-Cleaning Efficacy:

- Clinsodent and VI Clean significantly reduced OD values across all stains ($p<0.001$).
- Lemon juice showed moderate efficacy.
- Aloe vera had the lowest cleaning efficacy, performing worse than the control in coffee-stained samples.

Best Performing Cleansers:

- **Tea:** Clinsodent > VI Clean > Aloe vera
- **Coffee:** Clinsodent > VI Clean > Lemon juice
- **Turmeric:** VI Clean > Clinsodent > Lemon juice

DISCUSSION

Removable prostheses restore missing teeth, with PMMA acrylic resin commonly used for denture bases due to its aesthetics, affordability, and biocompatibility. As colour is crucial for appearance, long-term success depends on the material's ability to maintain colour over time.

One of the main issues that denture users are concerned about is the stains that build up on the dentures over time. This can result in unappealing prostheses and possibly denture stomatitis. [11,5] Substances that cause deposits on natural teeth, such as salivary calculus and tobacco stains, also accumulate on acrylic resin dentures and are similarly difficult to remove. [10] Calcareous deposits vary among individuals due to differences in saliva composition. The organic components, mainly proteins (15–30%), help bind deposits to artificial surfaces, while unsaturated fatty acids enhance plaque adhesion. [2]

Therefore, this study was undertaken to deal with this concern, by employing a designated scientific method to evaluate the efficacy of stain removal of commercially available chemical denture cleansers with natural denture cleansers. PMMA was chosen for sample fabrication as it is the most commonly used denture base material. Tea, coffee, and turmeric were selected as staining agents due to their widespread use in Indian diets.

Gupta et al. found turmeric with artificial saliva caused the most staining, followed by coffee and tea. Staining occurs through adsorption and absorption of pigments by resins, with turmeric's strong effect attributed to curcumin, a diarylhepnoid compound. [17] Scotti et al. explained that denture discoloration from tea and coffee is complex and primarily due to organic chromogens like tannins, caffeic acid, and chlorogenic acid. These compounds bind to surfaces through surface precipitation, causing staining without involvement of metal-based reactions. [18]

The stains on the acrylic resin samples utilised in the present study were considered effectively relevant because they correspond to dental stains that are frequently observed in vivo conditions. In this study, 150 heat-cured acrylic samples (50×10×2 mm) were fabricated as per ADA Specification No. 12 to fit the spectrophotometer cuvette. [19] Baseline optical density of each unstained sample was measured using a double beam UV/Visible spectrophotometer for later comparison.

Optical Density (OD) measures how much light a substance absorbs, with higher OD indicating greater absorption. It is calculated using the Beer-Lambert Law:

$$\mathbf{OD = A_{\lambda max} \times l}$$

Where:

- OD = Optical Density
- $A_{\lambda max}$ = Absorbance at the wavelength of maximum absorbance (λmax)
- l = Thickness of the sample (PMMA sheet/film)

A UV-Vis spectrophotometer identifies λmax by scanning the absorbance spectrum. [20]

The mean baseline optical density values of the stained samples was found to be 1.87 ± 0.018. Staining solutions of tea, coffee, and turmeric were prepared by dissolving 15 g of tea or coffee powder and 0.5 g of turmeric powder in 250 ml of water. The mixtures were stirred every 20 seconds for 10 minutes until cooled to room temperature. Solutions were filtered to remove undissolved particles and freshly prepared every 12 hours during sample immersion. The 150 samples were divided into three groups of 50 and immersed in tea (Group A), coffee (Group B), and turmeric (Group C) solutions for one month at 37 ± 1°C to simulate in vivo conditions. Optical density was recorded post-staining for comparison after denture cleanser treatment.

Both visual and instrumental methods can assess denture discoloration, but Okubo et al. found visual evaluation unreliable due to subjective variations in color perception. Factors like lighting, observer fatigue, eye adaptation, and visual acuity can affect consistency, making instrumental methods more accurate. [21] Hence, in this study, stain intensity was evaluated using a spectrophotometer for its ability to provide accurate and quantitative measurements.

The mean optical density values were 1.17 ± 0.009 for tea, 1.78 ± 0.009 for coffee, and 1.46 ± 0.005 for turmeric. Coffee-stained samples showed the highest staining intensity among the three agents.

Stains and deposits accumulate on dentures due to poor maintenance. Budtz-Jorgensen classified denture cleaning into mechanical (e.g., brushing, ultrasonic cleaners) and chemical methods (e.g., hypochlorites, peroxides, acids, enzymes, mouthwashes). [2] Chemical cleansers, especially alkaline peroxide solutions, are effective alternatives for those with limited dexterity. Abere DJ noted that elderly patients prefer immersion-type chemical cleansers, such as enzymes, acids, alkaline hypochlorites, peroxides, and disinfectants, as they clean thoroughly without causing abrasion or handling damage. [22] In this study, chemical (Clinsodent powder, VI-Clean liquid) and natural (lemon juice, aloe vera) denture cleansers were compared for stain removal. Solutions were prepared by mixing:

1. 1 tsp. Clinsodent powder in 100 ml water
2. 1 tsp. VI-Clean liquid in 100 ml water
3. 10 ml lemon juice in 100 ml water
4. 10 ml aloe vera in 100 ml water
5. 100 ml distilled water (control)

Clinsodent is a peroxide-based denture cleanser available in tablet and powder forms. When dissolved in water, it releases alkaline hydrogen peroxide, producing oxygen bubbles that aid in mechanical and antibacterial cleaning. It acts as a mild bleach and oxidizing agent, effectively lifting organic deposits and safe for metal components. [2]

VI-Clean contains sodium hypochlorite, which releases chloride ions in water, providing strong bleaching and disinfecting action by altering chromophores and breaking down plaque. However, it can corrode metal parts of dentures and must be used with care to avoid fabric damage. [22]

While chemical denture cleansers are effective in stain removal, they may affect the long-term integrity of acrylic dentures by reducing surface smoothness, altering colour, or fit. This has led to growing interest in natural alternatives like lemon juice and aloe vera, which are considered gentler, non-toxic, cost-effective, and environmentally friendly. [8] Natural cleansers may better preserve denture materials and appeal to those avoiding synthetic chemicals. [9] This study compares the stain removal efficacy of chemical (Clinsodent, VI-Clean) and natural (lemon juice, aloe vera) denture cleansers on heat-cured acrylic resins to identify the most effective and safe option.

Lemon juice, rich in citric acid, creates a low-pH environment that protonates stain molecules (e.g., tannins, nicotine), breaking their bonds with denture surfaces and making them easier to remove. As a natural chelating agent, citric acid binds metal ions in stains and disrupts biofilms by denaturing proteins and solubilizing debris. It also improves surface wettability and has mild antibacterial properties, aiding in stain removal and prevention. [14-16]

Aloe Vera removes stains through antimicrobial, enzymatic, and cleansing actions. Compounds like lupeol, salicylic acid, and saponins disrupt bacterial and fungal biofilms, while enzymes (e.g., amylase, lipase) break down food debris and organic stains. Salicylic acid gently exfoliates stains, and polysaccharides form a barrier against future build-up. Aloe vera offers a non-corrosive, gentle, and effective natural alternative to chemical denture cleansers [9, 12-13]

Stained samples were divided into subgroups and immersed in four denture cleansers (Clinsodent, VI Clean, lemon juice, aloe vera) and a control (distilled water) for 3 months. Post-treatment optical density was measured using a spectrophotometer.

Results showed significant differences in stain removal efficacy (ANOVA, $P < 0.001$):

- **Tea stains:** Clinsodent (1.14 ± 0.003) was most effective, followed by VI Clean (1.15 ± 0.003). Natural cleansers showed higher residual staining, with lemon juice (1.19 ± 0.003) performing the worst.
- **Coffee stains:** Clinsodent again performed best (1.62 ± 0.002), followed by VI Clean (1.65 ± 0.002). Aloe Vera had the highest residual stain (1.84 ± 0.003).
- **Turmeric stains:** VI Clean was most effective (1.38 ± 0.003), closely followed by Clinsodent (1.41 ± 0.003). Natural agents performed poorly, with aloe vera (1.46 ± 0.002) showing the least efficacy.

Clinsodent was most effective for tea and coffee stains, while VI Clean excelled with turmeric. Natural cleansers showed the least stain removal, confirming the superior efficacy of commercial chemical denture cleansers.

CONCLUSION

Chemical denture cleansers were more effective in stain removal compared to natural cleansers. Chemical cleansers, particularly Clinsodent and VI Clean, showed significantly higher stain removal efficacy compared to natural cleansers. Clinsodent was most effective for tea and coffee stains, while VI Clean performed best for turmeric stains. However, considering their biocompatibility and availability, natural products like lemon juice could be recommended as supplementary or temporary alternatives, particularly for patients sensitive to chemical agents.

Declaration by Authors

Acknowledgement: None

Source of Funding: None

Conflict of Interest: No conflicts of interest declared.

REFERENCES

1. Abelson DC. Denture plaque and denture cleansers. *J Prosthet Dent.* 1981; 45(4):376–378.
2. Jorgensen EB. Materials and methods for cleaning dentures. *J Prosthet Dent.* 1979; 42(6):619–626.
3. Yannikakis SA, Zissis AJ, Polyzois GL, Caroni C. Color stability of provisional resin restorative materials. *J Prosthet Dent.* 1998; 80(5):533–9.
4. Pipko DJ, El-Sadeek M. An in vitro investigation of abrasion and staining of dental resins. *J Dent Res.* 1972; 51(3):689–694.
5. Nakamoto K, Tamamoto M, Hamada T. Fungicidal effect on *Candida albicans* of denture cleansers with and without enzymes. *J Prosthet Dent.* 1991; 66(6):792–6.
6. Davi LR, Peracini A, Ribeiro NQ, Soares RB, Silva CHL, Paranhos HFO, de Souza RF. Effect of the physical properties of acrylic resin of overnight immersion in sodium hypochlorite solution. *Gerodontology.* 2010; 27(4):297–302.
7. Mueller HJ, Greener EH. Characterization of some denture cleansers. *J Prosthet Dent.* 1980; 43(5):491–494.
8. Kumar MN, Thippeswamy HM, Swamy KNR, Gujjari AK. Efficacy of commercial and household denture cleansers against Candida albicans adherent to acrylic denture base resin: An in vitro study. *Indian J Dent Res*. 2012;23(1):39–42
9. Shetty PJ, Hegde V, Gomes L. Anticandidal efficacy of denture cleansing tablet, Triphala, Aloe vera, and Cashew leaf on complete dentures of institutionalized elderly. *J Ayurveda Integr Med*. 2014; 5(1):11–14.
10. Nicholson RJ, Stark MM, Scott HE. Calculus and stain removal from acrylic resin dentures. *J Prosthet Dent.* 1968; 20(4):326–329.
11. Joseph RM. Comparison of efficacy of sodium hypochlorite with sodium perborate in the removal of stains from heat cured

clear acrylic resin. *J Indian Prosthodont Soc*. 2009; 9(1):6–10.
12. Sharrif MM, Verma SK. Aloe vera their chemicals composition and applications: A review. *Int J Biol Med Res*. 2011; 2(1):466–71.
13. Isadkar Y, Palaskar S, Narang B, Bartake A. Aloe vera as denture cleanser. *Journal of Dental & Allied Sciences*. 2018; 7(1).
14. Souza JG, Cordeiro JM, Lima CV, Barao VA. Citric acid reduces oral biofilm and influences the electrochemical behavior of titanium: An in situ and in vitro study. *Journal of periodontology*. 2019 Feb; 90(2):149-58.
15. Burel C, Kala A, Purevdorj-Gage L. Impact of pH on citric acid antimicrobial activity against Gram-negative bacteria. *Letters in Applied Microbiology*. 2021 Mar; 72(3):332-40.
16. Cordeiro JM, Pires JM, Souza JG, Lima CV, Bertolini MM, Rangel EC, Barao VA. Optimizing citric acid protocol to control implant-related infections: An in vitro and in situ study. *Journal of Periodontal Research*. 2021 Jun; 56(3):558-68.
17. Gupta G, Gupta T. Evaluation of the effect of various beverages and food material on the color stability of provisional materials-An in vitro study. *J Conserv Dent*. 2011; 14(3):287–92.
18. Scotti R, Mascellani SC, Forniti F. The in vitro color stability of acrylic resins for provisional restorations. *Int J Prosthodont* 1997 Mar-Apr; 10(2):164-168.
19. Revised American Dental Association Specifi cation No. 12 for denture base polymer, J Am Dent Assoc 1975; 2:90.
20. Kulkarni V, Radke U, Deshpande S, Pande N, Alsi S. Comparative evaluation of effectiveness of chemical, mechanical and chemico-mechanical methods of denture cleaning for removal of stains from heat polymerised acrylic resin denture base - An in- vitro study. *IP Annals of Prosthodontics and Restorative Dentistry*. 2024; 10(1):52-58.
21. Okubo SR, Kanawati A, Richards MW, Childress S. Evaluation of visual and instrument shade matching. *J Prosthet Dent*. 1998; 80(6):642–8.
22. Abere DJ. Post-placement care of complete and removable partial dentures. *Dent Clin North Am* 1979 Jan; 23(1):143-151.

How to cite this article: Amatullah Sadiya, Veerendra Prasad, Pawan Kumar, Sri Harsha Pudi, Swathi Nallabapani, Punyakeerthi. Comparative evaluation of stain removal efficacy of commercially available chemical denture cleansers with natural denture cleansers on heat cured acrylic denture base resins: an in vitro study. *International Journal of Research and Review*. 2025; 12(8): 211-220. DOI: *https://doi.org/10.52403/ijrr.20250824*

******