E-ISSN: 2618-0618
P-ISSN: 2618-060X

NAAS Rating (2025): 5.20
www.agronomyjournals.com
2025; SP-8(11): 197-200
Received: 19-08-2025
Accepted: 23-09-2025

Akshatha Maligoudru
M.Sc. Scholar, Department of Postharvest Management, Kittur Rani Channamma College of Horticulture, Arabhavi, University of Horticultural Sciences, Bagalkot, Karnataka, India

Manjula Karadiguddi
Assistant Professor, Department of Postharvest Management, College of Horticulture, Sirsi, University of Horticultural Sciences, Bagalkot, Karnataka, India

Kirankumar Gorabal
Associate Professor, Department of Postharvest Management, College of Horticulture, Bagalkot, University of Horticultural Sciences, Bagalkot, Karnataka, India

RT Patil
Associate Professor, Department of Floriculture and Landscape Architecture, College of Horticulture, Sirsi, University of Horticultural Sciences, Bagalkot, Karnataka, India

JS Hiremath
Associate Professor, Department of Plantation, Spice, Medicinal and Aromatic crops in College of Horticulture, Bagalkot, University of Horticultural Sciences, Bagalkot, Karnataka, India

Viresh Hiremath
Assistant Professor, Department of Postharvest Management, College of Horticulture, Bagalkot, University of Horticultural Sciences, Bagalkot, Karnataka, India

Prathiksha
Assistant Professor, Department of Postharvest Management, Kittur Rani Channamma College of Horticulture, Arabhavi, University of Horticultural Sciences, Bagalkot, Karnataka, India

Corresponding Author:
Akshatha Maligoudru
M.Sc. Scholar, Department of Postharvest Management, Kittur Rani Channamma College of Horticulture, Arabhavi, University of Horticultural Sciences, Bagalkot, Karnataka, India

Optimization of boiling duration and concentrate level for preparation of Nannari (*Hemidesmus indicus* (L.) R. Br.) Syrup

Akshatha Maligoudru, Manjula Karadiguddi, Kirankumar Gorabal, RT Patil, JS Hiremath, Viresh Hiremath and Prathiksha

DOI: https://www.doi.org/10.33545/2618060X.2025.v8.i11Sc.4225

Abstract
The present investigation entitled "Optimization of boiling duration and concentrate level for preparation of nannari (*Hemidesmus indicus* (L.) R. Br.) syrup" was conducted in the Department of Postharvest Management, Kittur Rani Channamma College of Horticulture (University of Horticultural Sciences, Bagalkot) Arabhavi, Belagavi district, Karnataka during 2024-25. The nannari syrup was prepared by using three different boiling durations (10, 20 and 30 min) and three levels of concentrate (25, 27.5 and 30%) in factorial completely randomized design and evaluated their physicochemical quality attributes. Nannari root has cooling property finds best use in beverage preparation. Dried nannari roots are commonly boiled and they are used in the preparation of beverages. But there is no standard scientific research for the preparation of extract, proportion of water and duration of boiling. Hence, to find out better recipes and to avoid the nutritional and medicinal losses the present investigation was planned. Organoleptically most acceptable nannari syrup obtained at the combination of 20 min boiling with 27.5 per cent concentrate with higher scores for colour (8.43), mouthfeel (8.40), flavour (8.44) and overall acceptability (8.42) with optimum scores for total soluble solids (65°B), titratable acidity (1.29%), total sugars (61.54%) and total phenolic content (82.91 mg GAE/100 ml).

Keywords: Concentrate, extract, nannari, phenols and syrup

Introduction
Herbal medicine is witnessing a global revival as people seek safe, natural alternatives to synthetic drugs. For centuries, herbs have been valued for their medicinal, aromatic and culinary qualities. Today, over 80 per cent of the global population relies on plant-based remedies, especially in developing nations like India and China, where traditional systems such as Ayurveda and Unani remain integral to healthcare. India with its rich biodiversity and ancient herbal knowledge, is home to over 45,000 plant species, of which 15,000 to 20,000 possess medicinal value, yet only a fraction was fully utilized. Despite contributing two-thirds of the plants used in modern medicine, India's share in the global herbal market remains minimal.

Medicinal plants are vital for both traditional therapies and modern pharmacology. Many life-saving drugs such as vincristine, taxol, morphine and curcumin are plant-derived. However, deforestation and overharvesting threaten this valuable resource, pushing many species toward extinction. Systems like Ayurveda promote a holistic view of health, integrating physical, mental and spiritual well-being. Globally, traditional medicine is gaining recognition, with China successfully integrating it into formal healthcare. The West, too, is embracing phytomedicine, as seen in the U.S. establishing research centres for alternative medicine (Joy *et al*., 1998) [10]. The growing preference for traditional systems such as Ayurveda and Unani, owing to their perceived safety and minimal side effects, highlights the potential for the wider use of nannari (Moorthy and Kumar, 2021) [11].

Nannari (*Hemidesmus indicus*), commonly known as Indian or false sarsaparilla, belongs to the family Apocynaceae. It is known by many vernacular names like Anantmula and Sariva in Sanskrit, Magrabu in Hindi, Sogadeberu in Kannada and Nannari in Tamil (Nandy *et al*., 2020)

[12]. The plant thrives in plains up to 600 m altitude under semi-dry to mesophytic conditions and is widely distributed across India from the Gangetic plains to the southern regions as well as in Sri Lanka, Pakistan, Iran, Bangladesh and Malaysia (Moorthy and Kumar, 2021) [11]. It also grows along rocky slopes in Karnataka, Andhra Pradesh and Tamil Nadu at altitudes of 300 to 1200 m (Akash *et al*., 2022) [2].

Nannari is a perennial, slender, twining shrub with numerous wiry stems containing milky latex. The leaves are opposite, simple and variable in shape, while the roots are the economic part. They are cylindrical, aromatic and yellowish-brown inside. Mature plants yield about 15 to 20 kg of roots. The harvested roots are washed, sun-dried, cut into chips and stored under ambient conditions (Raju and Ramana, 2011) [13].

The roots contain essential oils, notably 2-hydroxy-4-methoxy benzaldehyde, along with fatty acids, saponins, tannins, β-sitosterol, hemidesmin and lupeol (Banerjee and Ganguly, 2014) [4]. These phytochemicals give nannari its potent antioxidant and anti-inflammatory properties.

Traditionally, nannari roots are the main ingredient in nannari sherbet, a popular natural coolant known to purify the blood and relieve stomach burning (Singh *et al*., 2013) [17]. The plant is also used to treat respiratory ailments, eye diseases, loss of appetite, kidney disorders and fevers. Recognizing its medicinal importance, the National Medicinal Plant Board (NMPB) of India lists nannari as a highly traded species with an annual trade volume of 500 to1000 million tonnes (Yazhni *et al*., 2021) [20].

In rural Andhra Pradesh and Telangana, nannari drinks are consumed as affordable summer coolers. Tribal communities prepare chutneys and pickles from the roots for digestive support. The Yanadi tribes of Chittoor district depend heavily on nannari collection for income during the summer months when agriculture is dormant (Akash *et al*., 2022) [2]. The current investigation aimed to fix the suitable duration of boiling and level of concentrate for preparation of nannari syrup and to assess its quality.

Materials and Methods

The experiment was conducted during 2024-25 in the Department of Postharvest Management, Kittur Rani Channamma College of Horticulture (University of Horticultural Sciences, Bagalkot) Arabhavi, Belagavi district, Karnataka. Dried nannari (*Hemidesmus indicus* (L.) R. Br.) roots were procured from Ayurvedic Shop, Gokak of Belagavi District, Karnataka. The roots were carefully brought to the laboratory for subsequent experimental procedures. Other ingredients including sugar and citric acid were purchased from the local market in Gokak, Belagavi District. Glass bottles were sourced from the department. The experiment was conducted by using FCRD (Factorial Completely Randomized Design) with three replications and nine treatments.

Factor I - Duration of boiling

D_1 - 10 minutes
D_2 - 20 minutes
D_3 - 30 minutes

Factor II - Level of concentrate

L_1 - 25.00%
L_2 - 27.50%
L_3 - 30.00%

Treatment combinations

T_1 (D_1 L_1): 10 minutes + 25.00 per cent
T_2 (D_1 L_2): 10 minutes + 27.50 per cent
T_3 (D_1 L_3): 10 minutes + 30.00 per cent
T_4 (D_2 L_1): 20 minutes + 25.00 per cent
T_5 (D_2 L_2): 20 minutes + 27.50 per cent
T_6 (D_2 L_3): 20 minutes + 30.00 per cent
T_7 (D_3 L_1): 30 minutes + 25.00 per cent
T_8 (D_3 L_2): 30 minutes + 27.50 per cent
T_9 (D_3 L_3): 30 minutes + 30.00 per cent

Note: 1. Dried nannari roots were boiled in 1:10 water level
2. As per FSSAI, TSS and acidity of syrup was maintained in all the treatments

Methodology used for the preparation of nannari syrup

A quantity of 100 grams of dried nannari roots were thoroughly washed four to five times to eliminate dirt and soil particles. The cleaned roots were then boiled in 1000 ml of water (maintaining a 1:10 ratio) for duration of 10, 20 and 30 minutes. After boiling, the extract was collected and filtered, discarding the residual roots. Nannari extract was then used at concentrations of 25, 27.5 and 30 per cent. Water and sugar were added and the sugar was dissolved completely by heating. TSS was adjusted to approximately 65°B and acidity was maintained around 1.30 per cent by adding citric acid. The prepared syrup was then poured into pre-sterilized 200 ml glass bottles while still hot. Finally, the bottles were sealed with crown corks, labeled and stored at room temperature.

Analysis of physicochemical properties

TSS of nannari syrup was measured by using an 'Erma' make hand refractometer after necessary corrections. Titratable acidity (citric acid) was determined by AOAC (Anon.,1984) [3]. Total sugars were estimated using the DNSA method as described by Miller (1972). Total phenolic content of the sample was estimated using the Folin-Ciocalteu Reagent (FCR) method as described by Sadasivam and Manickam (2005) [16]. syrups were diluted to RTS to maintain TSS of 15°B and evaluated. The sensory assessments were performed by a semi-trained panel consisting of professors and postgraduate students of KRC College of Horticulture, Arabhavi using a nine-point hedonic scale (Ranganna, 2003) [14].

Results and Discussion

Effect of boiling duration and concentrate level on total soluble solids (TSS), titratable acidity, Total sugars and Total phenolic content of nannari syrup

The TSS of nannari syrup was maintained at 65°Brix for all treatments to ensure uniform concentration; hence, no significant difference was observed. The treatment D_3L_3 recorded the highest total sugars (63.87%) and total phenols (88.13 mg GAE/100 ml), which may be due to the concentration effect and enhanced extraction of phenolic compounds during prolonged boiling. The highest titratable acidity (1.30%) was observed in D_1L_3, attributed to the presence of more organic acids before thermal decomposition. Thus, longer boiling duration (D_3) improved the biochemical quality of nannari syrup by increasing sugar and phenol content The present findings are in close agreement with those of Thakur *et al*. (2013) [18] in wild pomegranate syrup, Chauhan *et al*. (2018) [7] in wild prickly pear syrup, Thakur *et al*. (2018) [19] in wild aonla syrup and Bhatt *et al*. (2020) [5] in jamun syrup Reddy and Chikkasubbanna (2009) [15] in aonla syrup, Gaikwad and Alekar (2016) [9] in guava syrup, Abhimanyu and Thakur (2017) [1] in box myrtle (*Myrica nagi*) syrup and Faizi *et al*. (2017) [8] in mandarin orange syrup.

Effect of boiling duration and concentrate level on colour, mouthfeel, flavour and overall acceptability scores (9 point hedonic scale) of nannari RTS

The sensory characteristics of nannari RTS were significantly influenced by the duration of boiling and level of concentrate (Table 2). The treatment D_2L_2 recorded the highest scores for colour (8.43), mouthfeel (8.40), flavour (8.44) and overall acceptability (8.42). The superior sensory quality in this treatment may be attributed to optimum extraction of pigments and flavour compounds, mild caramelization and balanced concentration, which together imparted an appealing colour, pleasant mouthfeel and characteristic flavour to the beverage. Thus, moderate boiling duration (D_2) combined with a medium level of concentrate (L_2) was found to produce the most acceptable nannari RTS beverage, which is in agreement with earlier findings by Gaikwad and Alekar (2016) [9] in guava syrup, Abhimanyu and Thakur (2017) [1] in box myrtle (*Myrica nagi*) syrup, Bijane *et al.* (2021) [6] in Guava syrup

Table 1: Influence of duration of boiling and level of concentrate on titratable acidity, total sugars and total phenols of nannari syrup

Treatment	Titratable acidity (%)				Total sugars (%)				Total phenols (mg GAE/100 ml)			
	L_1	L_2	L_3	Mean of D	L_1	L_2	L_3	Mean of D	L_1	L_2	L_3	Mean of D
D_1	1.28	1.27	1.30	1.29	60.10	60.22	60.38	60.23	75.98	78.27	79.40	77.88
D_2	1.25	1.29	1.26	1.27	61.30	61.54	61.58	61.48	80.37	82.91	84.62	82.63
D_3	1.22	1.23	1.27	1.24	63.03	63.42	63.87	63.44	85.53	86.82	88.13	86.82
Mean of L	1.25	1.26	1.28	1.26	61.48	61.72	61.95	61.71	80.63	82.66	84.05	82.44
	S.Em±		CD @1%		S.Em±		CD @1%		S.Em±		CD @1%	
D	0.004		0.01		0.03		0.13		0.09		0.40	
L	0.004		0.01		0.03		0.13		0.09		0.40	
D × L	0.006		0.03		0.05		0.23		0.16		0.69	

D- Duration of boiling
D_1- Boiling duration for 10 min.
D_2- Boiling duration for 20 min.
D_3- Boiling duration for 30 min.

L- Level of concentrate
L_1- Level of concentrate @ 25%
L_2- Level of concentrate @ 27.5%
L_3- Level of concentrate @ 30%

Table 2: Influence of duration of boiling and level of concentrate on colour, mouthfeel, flavour and overall acceptability scores (9 point hedonic scale) of nannari RTS

Treatment	colour				Mouthfeel				Flavour				Overall acceptability			
	L_1	L_2	L_3	Mean of D	L_1	L_2	L_3	Mean of D	L_1	L_2	L_3	Mean of D	L_1	L_2	L_3	Mean of D
D_1	8.26	8.32	8.31	8.30	8.21	8.28	8.25	8.25	8.25	8.32	8.30	8.29	8.24	8.31	8.29	8.28
D_2	8.35	8.43	8.39	8.39	8.29	8.40	8.34	8.34	8.35	8.44	8.39	8.39	8.33	8.42	8.37	8.38
D_3	7.97	8.11	8.05	8.04	7.93	8.05	8.00	7.99	7.97	8.10	8.05	8.04	7.96	8.08	8.03	8.02
Mean of L	8.19	8.29	8.25	8.24	8.14	8.24	8.19	8.19	8.19	8.29	8.24	8.24	8.18	8.27	8.23	8.22
	S.Em±		CD @1%		S.Em±		CD @1%		S.Em±		CD @1%		S.Em±		CD @1%	
D	0.004		0.02		0.004		0.02		0.003		0.01		0.002		0.01	
L	0.004		0.02		0.004		0.02		0.003		0.01		0.002		0.01	
D × L	0.007		0.03		0.007		0.03		0.005		0.02		0.004		0.02	

D- Duration of boiling
D_1- Boiling duration for 10 min.
D_2- Boiling duration for 20 min.
D_3- Boiling duration for 30 min.

L- Level of concentrate
L_1- Level of concentrate @ 25%
L_2- Level of concentrate @ 27.5%
L_3- Level of concentrate @ 30%

Conclusion

Based on the results obtained, it can be concluded that the nannari syrup formulated with 20 minutes of boiling and 27.5 per cent level of concentrate demonstrated improved sensory properties and maintained better physicochemical characteristics. Hence this combination was found to be the best for obtaining superior quality nannari syrup compared to other combinations.

Further Research

- Preparation of nannari beverages by replacing refined sugar with other sweeteners such as stevia, jaggery or honey for health-conscious consumers
- Exploring synergistic herbal blends by combining nannari syrup with medicinal plants like tulsi, ashwagandha and aonla to enhance its nutraceutical potential and evaluate antioxidant and therapeutic effects
- Functional fortification by enriching nannari syrup with probiotics, prebiotics or dietary fibres to transform it into a health-oriented functional drink

References

1. Abhimanyu T, Thakur NS. Development of syrup from box myrtle (*Myrica nagi*) and its quality evaluation during storage. Int J Agric Sci. 2017;9(8):0975-3710.
2. Akash S, Padma M, Venkata Laxmi K, Gouthami P. Studies on standardization of nannari (*Decalepis hamiltonii* Wight and Arn.) RTS drink of nannari syrup with different flavours. Pharma Innov J. 2022;11(12):4168-4171.
3. Anonymous. Official method of analysis. 14th ed. Association of Official Analytical Chemists, Virginia. 1984. p. 424-462.
4. Banerjee A, Ganguly S. Medicinal importance of *Hemidesmus indicus*: A review on its utilities from ancient Ayurveda to 20th century. Adv Bioresearch. 2014;5(3):208-213.
5. Bhatt K, Thakur NS, Hamid AT, Sharma C. Optimization of juice and total soluble solids concentration for the preparation of wild jamun syrup: Effect of packaging materials and temperature conditions on nutritional quality during storage. Curr J Appl Sci Technol. 2020;39(5):116-124.

6. Bijane VS, Joshi PS, Dalal SR, Shingnare CA. Studies on quality and organoleptic evaluation of guava syrup. Pharma Innov J. 2021;10(9):238-242.
7. Chauhan M, Thakur NS, Sharma R, Thakur A. Studies on development and storage quality of syrup prepared from wild prickly pear fruit. J Hill Agric. 2018;9(3):345-351.
8. Faizi ZA, Dhemre J, Kad V, Musmade A, Shete M. Studies on storage behaviour of syrup prepared from Nagpur mandarin (*Citrus reticulata* Blanco). Int J Agric Sci Res. 2017;7(4):71-82.
9. Gaikwad SD, Alekar AN. Studies on preparation, chemical composition and sensory changes in guava RTS during storage. Adv Life Sci. 2016;5(12):4925-4931.
10. Joy PP, Thomas J, Mathew S, Skaria BP. Medicinal plants. In: Tropical Horticulture. 1998;2:449-632.
11. Moorthy H, Kumar V. *Hemidesmus indicus* (L.) R. Br.: An overview. Plant Arch. 2021;21(1):2132-2143.
12. Nandy S, Mukherjee A, Pandey DK, Ray P, Dey A. Indian sarsaparilla (*Hemidesmus indicus*): Recent progress in ethnobotany, phytochemistry and pharmacology. J Ethnopharmacol. 2020;254:112609.
13. Raju AS, Ramana KV. Traditional preparation of a health drink nannari sherbet from the root extract of *Decalepis hamiltonii* Wight and Arn. Indian J Nat Prod Resour. 2011;2(1):121-124.
14. Ranganna S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. New Delhi: Tata McGraw-Hill; 2003. p.47-56.
15. Reddy AH, Chikkasubbanna V. Studies on the storage behaviour of aonla syrup. Asian J Hortic. 2009;4(1):5-9.
16. Sadasivam MS, Manickam A. Biochemical Methods. 2nd ed. New Delhi: New Age International Publishers; 2005. p. 193-194.
17. Singh JP, Singh SK, Kalaichelvan C. Formulation of nannari based nutrient-rich soft drink. Int J Curr Res. 2013;8:21-28.
18. Thakur NS, Dhaygude S, Joshi VK. Development of wild pomegranate aril-in-syrup and its quality evaluation during storage. Int J Food Ferment Technol. 2013;3(1):33-40.
19. Thakur NS, Thakur N, Hamid TA, Thakur A. Studies on development and storage quality evaluation of vitamin C rich syrup prepared from wild aonla (*Phyllanthus emblica* L.) fruits. Pharma Innov J. 2018;7(2):167-172.
20. Yazhni P, Chandirakala R, Gowthami R, Vanniarajan C, Renuka R, Suresh J. Morphological characterization of Indian sarsaparilla (*Hemidesmus indicus* (L.) R. Br. ex Schult.)): A potential medicinal plant. Electron J Plant Breed. 2021;12(3):652-658.