

Health Benefits of Noni Juice

Subjects: Food Science & Technology

Contributor: Brett West

Noni juice is a globally popular health beverage originating in the tropics. Traditional healers believe the noni plant to be useful in treating a wide range of maladies. Consumers throughout the world have similar perceptions. To better understand the potential health benefits of noni juice, human intervention studies are reviewed and discussed.

Keywords: noni juice ; *Morinda citrifolia* ; clinical trial ; antioxidant ; immune system ; inflammation

1. Introduction

Noni juice has become a popular health supplement. In the first dozen years of its commercial marketing, more than 106 million liters of Tahitian Noni® Juice (Morinda, Inc., American Fork, UT, USA) were consumed in more than 80 nations ^[1]. Noni juice was one of the first whole foods approved under the European Union's 1997 novel food regulations ^[2]. The Chinese government has also approved one source of noni juice as a safe new resource and has approved it as a functional food that can enhance immunity ^[3].

Noni is the common name for *Morinda citrifolia*, a small to medium sized tree (3–10 m high) with a pantropical distribution ^[4]. Noni fruit and leaves have a history of food use among Pacific Islanders as well as in Southern and Southeast Asia. Although the fruit is edible, its flavor has been described as akin to bad cheese ^[5]. Despite this, Rarotongans ate the fruit often and the Burmese used it to prepare curries ^{[6][7]}. Australian Aborigines ate noni fruit during the cool-dry season from May to August in the Northern Territory of Australia ^{[8][9]}. Noni leaves were eaten both in raw and cooked form in Java and Thailand ^[10]. In Tahiti, fish were wrapped in the leaves as a part of baking to impart an appealing flavor to the cooked fish ^[11].

More recently, the fruit has been used to produce dietary supplements. French Polynesia has been a major source of this juice where noni fruit puree constitutes one of the area's largest agricultural exports ^[12]. In fact, more than 21,000 metric tons of this puree was exported in the past decade ^[13]. The noni plant was the most important and widely used Polynesian medicinal plant prior to the arrival of Europeans with Tahitian healers using it in many remedies ^[14]. Some uses of the fruit include the treatment of inflammation, abscesses, angina, diabetes, ranula, abdominal fibromas, and scorpionfish stings ^{[15][16]}. In other parts of French Polynesia, noni fruit has been reportedly used to treat osteoarthritis, rheumatism, backache, joint problems, hemorrhoids, skin allergies, burns, and warts ^[17]. The global popularity of the juice is attributable to its perceived health value. Indeed, European consumers of a Tahitian-sourced noni juice beverage frequently have reported health benefits including increased energy, improved well-being, reduction of pain, fewer infections, improved sleep, improved digestion, as well as a reduction in allergy and asthma symptoms ^[18].

2. Antioxidant and DNA Protection

A series of double-blind, placebo-controlled, 30-day intervention studies involving cigarette smokers has demonstrated the substantial antioxidant activity of a mixed noni juice (TNJ). The first of these involved 285 adult volunteers who smoked more than 20 cigarettes per day ^[19]. The participants were assigned randomly to a placebo, 29.5 mL TNJ/day, or a 118 mL TNJ/day group. The placebo was composed of grape and blueberry juices with a cheese flavor added to mimic the noni flavor. Blood plasma levels of superoxide anion radicals (SAR) and lipid hydroperoxide (LOOH) levels were measured at the beginning and end of the trial with participants continuing to smoke throughout the trial. TNJ ingestion reduced average plasma SAR by 26.9% and 30.8% in the 29.5 and 118 mL groups, respectively. Average LOOH levels in the 29.5 mL group were reduced by 24.5% while the 118 mL group experienced a 27.3% reduction. No significant reductions in SAR or LOOH levels occurred in the placebo group. Despite the presence of high antioxidant fruit juice in the placebo, the inhalation of large quantities of tobacco smoke resulted in more oxidative stress than could be overcome with grape and blueberry juices alone. Therefore, the SAR and LOOH reduction was attributable to the antioxidant properties, whether direct or indirect, of noni juice alone or in combination with the other ingredients.

The second smoker study was completed with 203 subjects [20]. The study intervention was the same as that mentioned above. However, in this study, peripheral blood lymphocytes (PBLs) were isolated from pre-and post-trial whole blood samples and evaluated for the degree of aromatic DNA adduct formation using a ^{32}P -postlabeling assay. By the end of the 30-day study period, average aromatic DNA adduct levels dropped by 44.9% ($p < 0.001$) among those drinking either one fluid ounce (29.5 mL) or four fluid ounces (118 mL) of TNJ per day. There were no significant differences in gender-specific responses. But at the lower dose, males experienced a greater decrease in aromatic DNA adducts than females (56.1% vs. 43.1% reduction, respectively). No adverse effects were observed in this trial.

Another randomized, double-blind, placebo-controlled study was completed with 245 heavy cigarette smokers [21]. This trial measured changes to lipid peroxidation–derived DNA adducts after 30 days of mixed noni juice beverage ingestion. Participants in this study were assigned to the same dose groups with the same placebo and TNJ that were used in the antioxidant trial. Again, a ^{32}P -postlabeling assay was used following isolation of DNA from PBLs. The previous DNA protection study measured aromatic DNA adducts which were more likely to be formed by direct reactions with chemicals in cigarette smoke or their immediate metabolites. In this second study, measurements were made specifically of DNA adducts resulting from cigarette smoke-induced oxidative stress and consequent lipid peroxidation. At the completion of the trial period, the placebo group did not experience any reduction in DNA damage. However, the lipid peroxidation–derived DNA adduct levels in those who drank TNJ declined significantly by 46.9% to 57.4%. This effect is consistent with both previous studies where reactive oxygen species and aromatic DNA-adduct concentrations were significantly reduced.

3. Blood Lipid Normalization, High Sensitivity C-Reactive Protein (hs-CRP) and Homocysteine Reduction

As with the antioxidant and DNA adduct studies, adult smokers provided further insight into the effect of 30 days of TNJ ingestion on blood lipids and hs-CRP. In a randomized, double blind, placebo-controlled clinical trial with 132 volunteers [22], heavy smokers (≥ 20 cigarettes/day) were chosen as subjects because smoking has been reported to increase blood lipids, systemic inflammation, and serum homocysteine [23][24][25]. Pre- and post-study serum cholesterol, triglyceride, low density lipoprotein cholesterol (LDL), high density lipoprotein cholesterol (HDL), hs-CRP, and homocysteine were measured for all participants who continued smoking during the trial. In this study, the dose groups were the same as in the previously discussed smoker studies.

After drinking TNJ for 30 days, the placebo group had no significant changes in any measurements. But among those who drank TNJ, there were significant declines in average hs-CRP (15.2%) and homocysteine (23.9%) with an increase in HDL (from 49 to 57 mg/dL). Mean total cholesterol, LDL, and triglycerides were also decreased among those in the TNJ groups. However, the degree of change was dependent on initial (pre-trial) values. Larger declines in mean values were associated with greater initial total cholesterol, LDL, or triglycerides levels. For example, decreases in average total cholesterol in the low (190–219 mg/dL), middle (220–299 mg/dL), and high (>300 mg/dL) baseline strata of the 29.5 mL group were 12.1, 17.3, and 36.4%, respectively. No participants in either TNJ group experienced any changes that resulted in below normal reference values for individual blood lipid levels. As such, the changes experienced were towards or remained within normal healthy ranges. These results indicate that TNJ helped normalized lipid levels in heavy smokers.

A second, although smaller, study examined the cholesterol lowering activity of TNJ in nonsmokers [26]. This open-label pilot study involved older adults (>40 years) who had normal or borderline high cholesterol levels and were not taking cholesterol-lowering medication nor drinking alcohol. Each participant drank two fluid ounces (59 mL) of TNJ twice per day for 30 days. No other changes to lifestyle habits were made during the trial period. There was no significant difference between pre- and post-trial total cholesterol, HDL, and LDL levels, or TC/HDL ratio. These results suggest that the cholesterol modulating effect of TNJ in heavy smokers is likely a result of its ability to protect against cigarette smoke-induced dyslipidemia via antioxidant activity.

4. Improvement of Joint Pain and Mobility

Topical treatment of pain and bruising is one of the most common uses of the noni plant in tropical alternative medicine. Some animal studies suggest that noni possesses possible anti-inflammatory activity [27][28][29]. In fact, one of the traditional names for noni in the Caribbean was “pain killer” [30]. Among the published anti-nociceptive and anti-inflammatory studies of noni juice are two open-label clinical trials that demonstrate potential joint health benefits. The earlier of these two trials reported pain reduction and improved range of motion (flexion, extension, lateral flexion, and rotation) in patients suffering from cervical spondylosis after four weeks of ingesting 15 mL TNJ every morning and

evening [31]. This trial enrolled 90 patients who were assigned to one of three treatment groups: standard physiotherapy alone, TNJ alone, and combined treatment (physiotherapy plus TNJ). Pre- and post-treatment measurements of pain intensity and neck flexibility (cervical range of motion) were compared within and among the treatment groups. At the start of the trial, all subjects in the TNJ alone group fell within the 5–7 (moderate to severe) pain intensity range. By the end of the study, the pain intensity range of this group had decreased to 0–4 (none to very moderate), with complete relief of neck pain in 60 percent of patients. The physiotherapy alone and combined treatment groups also experienced significant reduction in pain symptoms, with the combined treatment group experiencing the greatest reduction in pain intensity. Range of motion improved among all three treatment groups by the end of the trial period. For example, mean lateral flexion and rotation approximately doubled in the TNJ alone and physiotherapy alone groups. Although improvements in the TNJ alone group were no different than those of the standard physiotherapy alone group, a significantly greater improvement occurred in the combined treatment group.

A second joint health trial of TNJ involved osteoarthritis patients [32]. In this open-label intervention study, 82 volunteers drank three fluid ounces (88.5 mL) of TNJ (1 ounce before breakfast, 1 ounce before lunch, and 1 ounce before bedtime) every day. Those enrolled in the study were adults (40–75 years), had an X-ray diagnosis of osteoarthritis of the hip or knee, were not taking prescription medication for arthritis, and were willing to consume TNJ for 90 days. Blood samples were collected from the participants for clinical laboratory analysis at enrollment and after the 90-day intervention period. The Arthritis Impact Measurement Scales (AIMS2) were used to measure pre- and post-study pain/discomfort levels. The Short Form-36, version 2 (SF-36 V2) was used to measure pre- and post-study patient quality of life.

By the end of the intervention period, significant improvements in mean quality of life measurements occurred. These included a reduction in the duration of arthritis pain, including a 23.7% decrease in the frequency (in days) of severe pain, and 16.4% decrease in pain severity. Patients also experienced an improved psychological state and mood and improved mobility. Patient satisfaction with personal health also increased by approximately 19%. As with previous studies, TNJ was well tolerated and appeared to be safe. No significant changes to liver or kidney functions occurred after three months of TNJ ingestion nor were there changes to blood glucose, total cholesterol, or triglyceride levels. It is important to note that since no placebo or control group was included in this trial, it is difficult to determine how much of the observed outcome was a result of the placebo effect.

A double-blind placebo-controlled trial involving female university students suffering from dysmenorrhea was completed to evaluate the efficacy of a capsule containing 400 mg milled “noni herb powder”, calcium sulfate, gelatin, silica, and magnesium stearate [33]. Over the course of three menstrual cycles, noni capsule ingestion did not improve menstrual pain when compared with the placebo. However, there was some evidence of a significant decline in mean erythrocyte sedimentation rate (ESR) among those taking the noni capsule. This indicated some degree of anti-inflammatory activity, although not enough to affect pain symptoms. While this study did not involve noni fruit juice, it highlights issues regarding noni product identity and variation in potential efficacy. The product used in this study was identified as a “noni herb powder” with no indication as to the geographic origin, plant part used, or harvesting and processing conditions. As will be discussed in more detail, there is wide variability among nutrient and phytochemical compositions of commercial noni products [34]. These differences preclude assumptions that results from clinical trials of a specific noni product are applicable to other noni products. The two previously discussed trials involved the French Polynesian-derived noni juice blend (TNJ) used in the smoker studies. However, this latter trial evaluated a noni herb powder of relatively unknown identity. Therefore, the lack of significant pain reduction in the latter trial does not necessarily refute the pain reduction observations of the cervical spondylosis and osteoarthritis trials. However, it is interesting that all three trials did provide some evidence of anti-inflammatory activity.

References

1. European Food Safety Authority. Scientific Opinion of the Panel on Dietetic Products Nutrition and Allergies on a request from the European Commission on the safety of Tahitian Noni® ‘*Morinda citrifolia* (Noni) fruit puree and concentrate’ as a novel food ingredient. EFSA J. 2009, 998, 1–16.
2. European Commission. Commission decision of 5 June 2003 authorising the placing on the market of “noni juice “(juice of the fruit of *Morinda citrifolia* L.) as a novel food ingredient under regulation (EC) No 258/97 of the European parliament and of the council. Off. J. Eur. Union L 144 2003, 46, 12. Available online: (accessed on 11 December 2017).
3. China Food and Drug Administration. June 27, 2011 Health Food Record Information Release. Available online: (accessed on 11 December 2017).

4. Morton, J. The ocean-going Noni, or Indian Mulberry (*Morinda citrifolia*, Rubiaceae) and some of its "colorful" relatives. *Econ. Bot.* 1992, 46, 241–256.
5. Stone, B.C. *Morinda Linnaeus. Micronesica* 1970, 6, 1–659.
6. Cheesman, T.F. The flora of Raratonga, the chief island of the Cook group. *Trans. Linn. Soc. Lond.* 1903, 6, 261–313.
7. Hedrick, U.P. *Sturtevant's Notes on Edible Plants*; J.B. Lyon Company: Albany, NY, USA, 1919; p. 368.
8. Maiden, J.H. *Useful Native Plants of Australia (and Tasmania)*; Technological Museum of New South Wales: Sydney, Australia, 1889; p. 45.
9. Rae, C.J.; Lamprell, V.L.; Lion, R.J.; Rae, A.M. The role of bush foods in contemporary Aboriginal diets. *Proc. Nutr. Soc. Aust.* 1982, 7, 45–48.
10. Ochse, J.J.; van den Brink, C.B. *Vegetables of the Dutch East Indies (Edible Tubers, Bulbs, Rhizomes and Spices Included): Survey of Indigenous and Foreign Plants Serving as Pot-Plants and Side-Dishes*; Archipel Drukkerij: Java, Indonesia, 1931; pp. 630–632.
11. Henry, T. *Ancient Tahiti: Bernice P. Bishop Museum Bulletin 48*; Bernice P. Bishop Museum: Honolulu, HI, USA, 1928; p. 59.
12. West, B.J.; Jensen, C.J.; Westendorf, J. A new vegetable oil from noni (*Morinda citrifolia*) seeds. *Int. J. Food Sci. Technol.* 2008, 43, 1988–1992.
13. Bouzerand, E. *Points Forts De la Polynésie Française: Bilan Commerce Exterieur 2016*. Institut de la Statistique de la Polynésie Française, Papeete, French Polynesia. 2017. Available online: (accessed on 12 December 2017).
14. Whistler, W.A. *Polynesian Herbal Medicine*; National Botanical Garden: Hong Kong, China, 1992; pp. 173–174. ISBN 0-915809-16-8.
15. Petard, P. *Quelques Plantes Utiles de Polynésie Française et Raau Tahiti: Haere Po No Tahiti*. Papeete, French Polynesia, 1986; pp. 280–286. ISBN 2-904171-06-1.
16. Brown, F.B.H. *Flora of Southeastern Polynesia: III. Dicotyledons*; Bishop Museum Bulletin 130; Bernice P. Bishop Museum: Honolulu, HI, USA, 1935; pp. 306–308.
17. Girardi, C.; Butaud, J.F.; Ollier, C.; Ingert, N.; Weniger, B.; Raharivelomanana, P.; Moretti, C. Herbal medicine in the Marquesas Islands. *J. Ethnopharm.* 2015, 161, 200–213.
18. Westendorf, J.; Mettlich, C. The benefits of noni juice: An epidemiological evaluation in Europe. *J. Med. Food Plants* 2009, 1, 64–79.
19. Wang, M.Y.; Lutfiyya, M.N.; Weidenbacher-Hoper, V.; Anderson, G.; Su, C.X.; West, B.J. Antioxidant activity of noni juice in heavy smokers. *Chem. Cent. J.* 2009, 3.
20. Wang, M.Y.; Peng, L.; Lutfiyya, M.N.; Henley, E.; Weidenbacher-Hoper, V.; Anderson, G. *Morinda citrifolia* (noni) reduces cancer risk in current smokers by decreasing aromatic DNA adducts. *Nutr. Cancer* 2009, 61, 634–639.
21. Wang, M.Y.; Peng, L.; Jensen, C.J.; Deng, S.; West, B.J. Noni juice reduces lipid peroxidation–derived DNA adducts in heavy smokers. *Food Sci. Nutr.* 2013, 1, 141–149.
22. Wang, M.Y.; Peng, L.; Weidenbacher-Hoper, V.; Deng, S.; Anderson, G.; West, B.J. Noni juice improves serum lipid profiles and other risk markers in cigarette smokers. *Sci. World J.* 2012.
23. Craig, W.Y.; Palomaki, G.E.; Haddow, J.E. Cigarette smoking and serum lipid and lipoprotein concentrations: An analysis of published data. *BMJ* 1989, 298, 784–788.
24. Jefferis, B.J.; Lowe, G.D.; Welsh, P.; Rumley, A.; Lawlor, D.A.; Ebrahim, S.; Carson, C.; Doig, M.; Feyerabend, C.; McMeekin, L.; et al. Secondhand smoke (SHS) exposure is associated with circulating markers of inflammation and endothelial function in adult men and women. *Atherosclerosis* 2010, 208, 550–556.
25. Fröhlich, M.; Sund, M.; Löwel, H.; Imhof, A.; Hoffmeister, A.; Koenig, W. Independent association of various smoking characteristics with markers of systemic inflammation in men. Results from a representative sample of the general population (MONICA Augsburg Survey 1994/95). *Eur. Heart J.* 2003, 24, 365–372.
26. Palu, A.K.; Brown, A.; Deng, S.; Kaluhiokalani, N.; West, B.J. The effects of noni (*Morinda citrifolia* L.) fruit juice on cholesterol levels: A mechanistic investigation and an open label pilot study. *J. Appl. Pharm. Sci.* 2012, 2, 25–30.
27. Chang, Y.Y.; Lin, Y.L.; Yang, D.J.; Liu, C.W.; Hsu, C.L.; Tzang, B.S.; Chen, Y.C. Hepatoprotection of noni juice against chronic alcohol consumption: Lipid homeostasis, antioxidation, alcohol clearance, and anti-inflammation. *J. Agric. Food Chem.* 2013, 61, 11016–11024.
28. Basar, S.; Uhlenhut, K.; Högger, P.; Schöne, F.; Westendorf, J. Analgesic and antiinflammatory activity of *Morinda citrifolia* L. (Noni) fruit. *Phytother. Res.* 2010, 24, 38–42.

29. Dussossoy, E.; Brat, P.; Bony, E.; Boudard, F.; Poucheret, P.; Mertz, C.; Giaimis, J.; Michel, A. Characterization, anti-oxidative and anti-inflammatory effects of Costa Rican noni juice (*Morinda citrifolia* L.). *J. Ethnopharm.* 2011, 133, 108–115.
30. Little, E.L.; Wadsworth, F.H. *Common Trees of Puerto Rico and the Virgin Islands*; Agriculture Handbook No. 249; U.S. Department of Agriculture, Forest Service: Washington, DC, USA, 1964.
31. Akinbo, S.R.A.; Noronha, C.C.; Okanlawon, A.O.; Denesi, M.A. Comparative study of the effect of *Morinda citrifolia* (Noni) with selected physiotherapy modalities in the management of patients with cervical spondylosis. *Niger. J. Health Biomed. Sci.* 2006, 5, 6–11.
32. Wang, M.Y.; Lutfiyya, M.N.; Weidenbacher-Hoper, V.; Peng, L.; Lipsky, M.S.; Anderson, G. *Morinda citrifolia* L. (noni) improves the quality of life in adults with osteoarthritis. *Funct. Food Health Dis.* 2011, 1, 75–90.
33. Fletcher, H.M.; Dawkins, J.; Rattray, C.; Wharfe, G.; Reid, M.; Gordon-Strachan, G. *Morinda citrifolia* (Noni) as an anti-Inflammatory treatment in women with primary dysmenorrhoea: A randomised double-blind placebo-controlled trial. *Obstet. Gynecol. Int.* 2013.
34. West, B.J.; Tolson, C.B.; Vest, R.G.; Jensen, S.; Lundell, T.G. Mineral variability among 177 commercial noni juices. *Int. J. Food Sci. Nutr.* 2006, 57, 556–558.

Retrieved from <https://encyclopedia.pub/entry/history/show/28981>