Indian Spices and Health

Susan Kundrat, MS, RDN, CSSD, LDN
Clinical Associate Professor, University of Wisconsin-Milwaukee
Indian Spices in Milwaukee?
THANK YOU CINDY!

30 years ago, Registered Dietitian and SCAN Leader Cindy Conroy not only helped me land my first job as a cardiac dietitian, but she also sat me down and said “Now you need to join SCAN!”
Thank you to the Milwaukee Indian Spices Group!

Courtney Chramowicz, B.S. in Nutritional Sciences, UW-Milwaukee

Saira Talwar, Ph.D. student in Kinesiology, UW-Milwaukee

*Coming Soon! Look for a new article on Indian Spices and Health in the upcoming Winter SCAN PULSE.
Behold the Power of Indian Spices

Before Indian Spices

After Indian Spices

...and on the way to the NBA TITLE!
Indian Spices and Health

“Spices were some of the most valuable items of trade in the ancient and medieval world. Herbalists and folk practitioners have used plant remedies for centuries, but only recently have scientists begun to study the powers of common herbs and spices.”

-Vasanthi and Parameswari, Current Cardiology Reviews, 2010
Indian Spices and Health

“...”the anti-proliferative, anti-hypercholesterolemic, anti-diabetic, anti-inflammatory effects of spices have overriding importance, as the key health concerns are diabetes, cardiovascular diseases, arthritis, and cancer.”

-Vasanthi and Parameswari, Current Cardiology Reviews, 2010
Statistics of spice-disease associations.

Historical trend in biomedical literature reporting spice-disease associations. There is an exponential increase in articles reporting the therapeutic effects of spices in last few decades. Data of research articles archived in MEDLINE till July 2017 is represented in the illustration.
Background Resources

Consumerlab.com
• [https://www.consumerlab.com/](https://www.consumerlab.com/)

Natural Medicines Database
• [https://www.scandpg.org/nutrition-info/natural-medicines-comprehensive-database](https://www.scandpg.org/nutrition-info/natural-medicines-comprehensive-database)
Turmeric

• Curcumin found in Turmeric (Curcuminoids) - antioxidant and anti-inflammatory

• Benefits include aiding in the management of: arthritis, depression, GI concerns, dyslipidemia, and many others

• Best absorbed with black pepper and fat at a meal
Origin

- Botanical name
  - *Curcuma longa*

- Major flavor compound
  - Turmerone and ar-turmerone

- Region of cultivation
  - Native to and cultivated in India (produces 90% of all turmeric powder) but also China, Thailand, Cambodia, Malaysia, Indonesia, and the Philippines.

- Parts used
  - Rhizomes of the plant (fresh, dried, or powdered); occasionally fresh leaves

Farrimond, 2018
• Mesalamine – common therapy for mild-moderate ulcerative colitis (UC)
  • If fails, then patients are prescribed other drugs with possible detrimental side effects
Purpose/Methods

• The purpose of this study is to examine if curcumin works as an additional mode of therapy with mesalamine for remission induction

• Multi-center randomized, double-blind placebo-controlled trial

• Patients age 18-70 years old with active mild-to-moderate active UC
  • Patients to be stable on their medications for at least 12 weeks prior to study

• All patients to be on optimal oral + topical mesalamine treatment

• 1 month of 3 g oral curcumin capsule – Cur-cure 95% pure curcumin preparation

Lang et al., 2015
Results

![Graph showing clinical response and remission rate at study end point at week 4.]

**Figure 1.** Clinical response and remission rate at study end point at week 4.

Lang et al., 2015
Results

Figure 2. (A) Endoscopic response and remission rate at study end point at week 4. (B) Mean endoscopic rate at week 0 compared with week 4 in the 2 study groups.

Lang et al., 2015
Practical Application

• Curcumin + optimized mesalamine > optimized mesalamine for remission induction for patients with active mild-to-moderate UC

• Larger clinical trials are warranted

Lang et al., 2015
Efficacy of Turmeric Extracts and Curcumin for Alleviating the Symptoms of Joint Arthritis: A Systematic Review and Meta-Analysis of Randomized Clinical Trials

James W. Daily, Mini Yang, and Sunmin Park
Background

- Arthritis – joint inflammation
- Usually treated with analgesics, steroids, NSAIDs (non-steroidal anti-inflammatory drugs)
  - NSAIDs – COX inhibitors that provide downstream reduction in inflammation
- Turmeric supplement – 80-95% curcuminoids (curcumin)
  - Modifies: signaling and activities of NF-κB, proinflammatory cytokines (interleukins), COX-2, and 5-LOX activities

**PURPOSE:** Systematic review of RCTs that studied effects of turmeric or curcumin for arthritis treatment to understand the efficacy for symptom control

Daily et al., 2016
Results

PVAS (PAIN)

PAIN and ARTHRITIS SEVERITY

PAIN and ARTHRITIS SEVERITY vs. MEDS

Daily et al., 2016
Practical Application

• 8-12 weeks of ~1000mg/d of curcumin helped reduce pain and inflammatory symptoms
• Sample sizes were relatively small (45-124), so further investigation is warranted
• Systemic bioavailability of curcumin needs to be further understood
Efficacy of curcumin, and a saffron/curcumin combination for the treatment of major depression: A randomised, double-blind, placebo-controlled study

Adrian L. Lopresti\textsuperscript{a,\*}, Peter D. Drummond\textsuperscript{a}
Background

• Depression is a growing public health concern, and is reported to effect 6-8% of adults every year
• Depression further affects social, occupational, education, personal aspects of life, and is a further burden on other ailments
• Curcumin and saffron have been studied for their antidepressant qualities
  • Saffron has been compared to anti-depressive benefits found with antidepressant medication fluoxetine and imipramine

Lopretsi al., 2017
Purpose

• One purpose of this study was to examine if lower dose of curcumin (than what previous studies have shown) would show similar benefits
• Another aim of this study was to investigate if saffron would provide similar antidepressant response as curcumin
  • Both has similar mechanisms of action and anti-depressant/anti-inflammatory/anti-inflammatory properties

Lopretsi al., 2017
## Methods

- 12-week, randomized, double-blind, placebo-controlled clinical trial
- 1-week placebo run-in phase

<table>
<thead>
<tr>
<th>Placebo (n=36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discontinued intervention (n=2)</td>
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<tr>
<td>Week 4</td>
</tr>
<tr>
<td>Completion of self-report inventories (n=34)</td>
</tr>
<tr>
<td>Discontinued intervention (n=2)</td>
</tr>
<tr>
<td>Week 8</td>
</tr>
<tr>
<td>Completion of self-report inventories (n=32)</td>
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<tr>
<td>Discontinued intervention (n=1)</td>
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<tr>
<td>Week 12</td>
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<tr>
<td>Completion of self-report inventories (n=31)</td>
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<table>
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<th>High-dose curcumin (n=33)</th>
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<td>Discontinued intervention (n=1)</td>
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<tr>
<td>Week 4</td>
</tr>
<tr>
<td>Completion of self-report inventories (n=32)</td>
</tr>
<tr>
<td>Discontinued intervention (n=1)</td>
</tr>
<tr>
<td>Week 8</td>
</tr>
<tr>
<td>Completion of self-report inventories (n=31)</td>
</tr>
<tr>
<td>Discontinued intervention (n=1)</td>
</tr>
<tr>
<td>Week 12</td>
</tr>
<tr>
<td>Completion of self-report inventories (n=30)</td>
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</table>

<table>
<thead>
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<td>Discontinued intervention (n=0)</td>
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<td>Week 4</td>
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<tr>
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<tr>
<td>Discontinued intervention (n=2)</td>
</tr>
<tr>
<td>Week 8</td>
</tr>
<tr>
<td>Completion of self-report inventories (n=26)</td>
</tr>
<tr>
<td>Discontinued intervention (n=0)</td>
</tr>
<tr>
<td>Week 12</td>
</tr>
<tr>
<td>Completion of self-report inventories (n=26)</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Low-dose curcumin + saffron (n=26)</th>
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</thead>
<tbody>
<tr>
<td>Discontinued intervention (n=1)</td>
</tr>
<tr>
<td>Week 4</td>
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<tr>
<td>Completion of self-report inventories (n=25)</td>
</tr>
<tr>
<td>Discontinued intervention (n=1)</td>
</tr>
<tr>
<td>Week 8</td>
</tr>
<tr>
<td>Completion of self-report inventories (n=24)</td>
</tr>
<tr>
<td>Discontinued intervention (n=0)</td>
</tr>
<tr>
<td>Week 12</td>
</tr>
<tr>
<td>Completion of self-report inventories (n=24)</td>
</tr>
</tbody>
</table>

Results

- Curcumin + saffron combination showed significant improvements in depressive symptoms compared to placebo ($p = 0.031$), as well as in anxiety inventory ($p < 0.001$)
- No significant improvements were found between curcumin dosages or curcumin + saffron combination
- Curcumin + saffron should be considered in reducing depression and anxiety symptoms
- Additional studies have noted decreased depressive symptoms utilizing 1,500 mg curcumin daily for 12-16 weeks
- Larger-scale studies are warranted

Lopreti al., 2017
**Turmeric**

**Consumption Recommendations**

- **Daily dose:** 500 mg – 2,000 mg curcuminoids
  - **Turmeric powder ~3% curcuminoids:**
  - **1 tsp ~ 5,000 mg turmeric, ~150 mg curcuminoids**
- **Fats or oils; black pepper**
- **Purity**

Consumerlab.com
Ginger

• Ginger has the potential to aid in several medical conditions such as dysmenorrhea, morning sickness, vertigo, and nausea.
• More recent studies focus on the relationship between ginger and osteoarthritis.
Origin

• Botanical name
  • *Zingiber officinale*

• Major flavor compound
  • Gingerol, shogaol, zingiberene

• Region of cultivation
  • Native to tropical Asia

• Parts used
  • Rhizomes of the plant (fleshy underground stems)
Efficacy and safety of ginger in osteoarthritis patients: a meta-analysis of randomized placebo-controlled trials

E.M. Bartels † *, V.N. Folmer †, H. Bliddal †, R.D. Altman † ‡, C. Juhl §, S. Tarp †, W. Zhang † ‡, R. Christensen † ‡
Background

• Purpose of study: to assess the clinical evidence of efficacy and safety of oral ginger in symptomatic treatment of osteoarthritis.

• Five trials (593 patients) were used in this meta-analyses
  • Published literature was retrieved from several different databases
  • All trials were randomized controlled trials comparing oral ginger

Bartels et al., 2015
# Results: Eligible trials

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Design</th>
<th>N (Ginger)</th>
<th>N (Placebo)</th>
<th>Age (years)</th>
<th>Females (%)</th>
<th>Knee/hip</th>
<th>Extraction technique and origin</th>
<th>Trial duration (weeks)</th>
<th>Daily dose (mg/day)</th>
<th>Accumulated dose (mg total)</th>
<th>Risk of bias</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altman</td>
<td>2001</td>
<td>PG</td>
<td>124</td>
<td>123</td>
<td>65†</td>
<td>151 (61%†)</td>
<td>247/0†</td>
<td>Extract of dried ginger rhizomes and dried galanga rhizomes (Eurovita Extract 77) with a content of hydroxyl-methoxy-phenyl compounds. Extraction method U.S. Patent Number: 6,638,525.</td>
<td>6</td>
<td>510</td>
<td>21,420</td>
<td>A/A/B</td>
</tr>
<tr>
<td>Wigler</td>
<td>2003</td>
<td>CO</td>
<td>11</td>
<td>13</td>
<td>62‡</td>
<td>23 (79%‡)</td>
<td>29/0‡</td>
<td>Liquid carbon dioxide extraction of Zingiber officinale</td>
<td>12</td>
<td>1,000</td>
<td>84,000</td>
<td>B/A/C</td>
</tr>
<tr>
<td>Haghighi</td>
<td>2005</td>
<td>PG</td>
<td>40</td>
<td>40</td>
<td>59§</td>
<td>31 (26%§)</td>
<td>n.a./n.a</td>
<td>95 % ethanol extraction of Zingiber officinale Rosc.</td>
<td>4</td>
<td>1,000</td>
<td>28,000</td>
<td>B/B/B</td>
</tr>
<tr>
<td>Zakeri</td>
<td>2011</td>
<td>PG</td>
<td>103</td>
<td>101</td>
<td>47∥</td>
<td>164 (80%∥)</td>
<td>204/0∥</td>
<td>Extract of Zingiber officinale, Zingibraceae. Extraction method not described</td>
<td>6</td>
<td>500</td>
<td>21,000</td>
<td>B/A/C</td>
</tr>
</tbody>
</table>


* Numbers based on 56 patients reported evaluable.
† Numbers based on patients included in the analysis.
‡ Numbers based on ITT-population.
§ Numbers based on 120 patients randomized in three treatments groups of 40; ginger extract, placebo and ibuprofen. Knee/Hip: Numbers of joints affected with OA in either knee or hip. n.a.: Data not specified/available. Risk of bias was assessed as (i) randomization including both sequence generation and the assessment of concealment of treatment allocation, (ii) blinding (incl., who were blinded), and (iii) adequacy of statistical analyses (i.e., proper ITT analysis). A = adequate; B = unclear; C = inadequate.
"Based on the empirical evidence, our data supports that oral ginger is able to reduce pain and disability in OA."

Bartels et al., 2015
Practical Application

• When compared to NSAIDs which are commonly used for OA, and can cause negative cardiovascular and GI side effects, ginger is generally considered safe. Mild side effects are upset stomach and a “bad taste in the mouth.”

• Reactions with other medications should be considered prior to using ginger as a therapy.

• Daily oral administration ranged from 500mg/day to 1000 mg/day, ginger products varied among studies.

Bartels et al., 2015
Ginger
Consumption Recommendations

• 500-1,000 mg ginger extract would be necessary to potentially reduce pain in OA patients with knee and hip pain.

• Powdered ginger
  • 1 gram (½ teaspoon) 2-3 times daily for 8 weeks
  • 3 g/day for 3 months
Fenugreek

• Fenugreek is used for diabetes, loss of appetite, dyspepsia, gastroesophageal reflux disease (GERD), gastritis, constipation, PCOS, hyperlipidemia, and for stimulating lactation.

• Recent studies look at the connection between fenugreek and diabetes.
Origin

- Botanical name
  - Trigonella foenum-graceum
  - T. caerulea (blue fenugreek)

- Major flavor compound
  - Sotolon

- Region of cultivation
  - Native to eastern Mediterranean and southwest Asia. Mainly cultivated in India but also in Mediterranean countries and North Africa

- Parts used
  - Seeds and young leaves
Effect of fenugreek on hyperglycaemia and hyperlipidemia in diabetes and prediabetes: A meta-analysis

Jing Gong, Ke Fang, Hui Dong, Dingkun Wang, Meilin Hu, Fuer Lu*

Institute of Integrated Traditional Chinese and Western Medicine, Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, Hubei 430030, China
Background

• The purpose of this study was to evaluate the effectiveness and safety in hyperglycemic patients to optimize clinical decision making.

• 10 articles were included in the analysis

• Fenugreek dosage ranged from 1 to 100 grams with the median treatment being 6.3 g.
  • Dosage was delivered in a capsule or powder.
  • Treatment duration ranged from 1 week to 3 years with the median treatment time being 60 days.

Gong et al., 2016
### Results

Gong et al., 2016

- **Fasting blood glucose** significantly reduced
- **Normal glucose tolerance** (NGT at 2 hours) significantly reduced
- **HbA1c** trended toward improvement

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**Table A: Fasting Blood Glucose (FBG)**

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Weight</th>
<th>Mean Difference</th>
<th>Mean Difference (IV, Random, 95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bordia A 1997-2</td>
<td>-1.099</td>
<td>2.4969</td>
<td>20</td>
<td>0.283</td>
<td>2.09</td>
<td>20</td>
</tr>
<tr>
<td>Bordia A 1997-3</td>
<td>-1.798</td>
<td>2.3332</td>
<td>20</td>
<td>0.232</td>
<td>2.34</td>
<td>20</td>
</tr>
<tr>
<td>Gaddam A 2015</td>
<td>-0.222</td>
<td>0.924</td>
<td>20</td>
<td>0.122</td>
<td>0.57</td>
<td>27</td>
</tr>
<tr>
<td>Ghattas LA 2008</td>
<td>0.3607</td>
<td>2.7512</td>
<td>24</td>
<td>0.056</td>
<td>1.76</td>
<td>10</td>
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<tr>
<td>Guo C-K 2012</td>
<td>-4.1</td>
<td>1.91049732</td>
<td>39</td>
<td>2.62</td>
<td>2.20206</td>
<td>33</td>
</tr>
<tr>
<td>Gupta A 2001</td>
<td>-1.578</td>
<td>1.9694</td>
<td>12</td>
<td>0.136</td>
<td>-1.36</td>
<td>13</td>
</tr>
<tr>
<td>Rafraf M 2014</td>
<td>-2.365</td>
<td>0.3262</td>
<td>44</td>
<td>1.199</td>
<td>0.35</td>
<td>44</td>
</tr>
<tr>
<td>Shen L 2013</td>
<td>-2.6</td>
<td>1.55140259</td>
<td>17</td>
<td>1.02</td>
<td>1.339154</td>
<td>16</td>
</tr>
<tr>
<td>Xiao J 2008</td>
<td>-0.8</td>
<td>3.97</td>
<td>313</td>
<td>0.015</td>
<td>4.759</td>
<td>153</td>
</tr>
</tbody>
</table>

**Total (95% CI):** 541
- Heterogeneity: $\text{I}^2 = 55.21$, $df = 8$ ($P < 0.0001$); $\text{I}^2 = 86$
- Test for overall effect: $Z = 3.10$ ($P = 0.002$)

**Table B: 2hBG**

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Weight</th>
<th>Mean Difference</th>
<th>Mean Difference (IV, Random, 95% CI)</th>
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<tbody>
<tr>
<td>Bordia A 1997-2</td>
<td>-0.6105</td>
<td>2.880872</td>
<td>20</td>
<td>0.2664</td>
<td>2.470495</td>
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<tr>
<td>Bordia A 1997-3</td>
<td>-0.8537</td>
<td>2.728073</td>
<td>20</td>
<td>0.5661</td>
<td>2.495958</td>
<td>20</td>
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<tr>
<td>Gaddam A 2015</td>
<td>-0.77145</td>
<td>1.56177</td>
<td>52</td>
<td>0.0866</td>
<td>1.748674</td>
<td>27</td>
</tr>
<tr>
<td>Ghattas LA 2008</td>
<td>-0.6556</td>
<td>2.90045</td>
<td>24</td>
<td>0.14985</td>
<td>2.598028</td>
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<tr>
<td>Guo C-K 2012</td>
<td>-3.8</td>
<td>2.294599</td>
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<td>0.26</td>
<td>2.350352</td>
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<tr>
<td>Gupta A 2001</td>
<td>-1.63725</td>
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<td>1.20435</td>
<td>2.331619</td>
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<tr>
<td>Shen L 2013</td>
<td>-4.03</td>
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<td>17</td>
<td>1.71</td>
<td>1.980227</td>
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<tr>
<td>Xiao J 2008</td>
<td>-1.4055</td>
<td>11.101948</td>
<td>313</td>
<td>0.035</td>
<td>11.99451737</td>
<td>153</td>
</tr>
</tbody>
</table>

**Total (95% CI):** 497
- Heterogeneity: $\text{I}^2 = 8.41$, $df = 7$ ($P = 0.36$); $\text{I}^2 = 17$
- Test for overall effect: $Z = 5.38$ ($P < 0.0001$)

**Table C: HbA1c**

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Mean</th>
<th>SD</th>
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<th>Mean Difference</th>
<th>Mean Difference (IV, Random, 95% CI)</th>
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<tr>
<td>Ghattas LA 2008</td>
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<td>0.4</td>
<td>2.54951</td>
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<tr>
<td>Guo C-K 2012</td>
<td>-3.1</td>
<td>1.450862</td>
<td>23</td>
<td>0.136</td>
<td>1.62788206</td>
<td>33</td>
</tr>
<tr>
<td>Gupta A 2001</td>
<td>-0.71</td>
<td>1.072007</td>
<td>24</td>
<td>-0.11</td>
<td>1.182709</td>
<td>13</td>
</tr>
<tr>
<td>Rafraf M 2014</td>
<td>-1.25</td>
<td>3.076901</td>
<td>24</td>
<td>0.4</td>
<td>2.54951</td>
<td>10</td>
</tr>
<tr>
<td>Shen L 2013</td>
<td>-2.57</td>
<td>1.079282</td>
<td>17</td>
<td>-0.98</td>
<td>0.99511306</td>
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</tr>
<tr>
<td>Suchitra MR 2015</td>
<td>-1.42</td>
<td>0.204082</td>
<td>44</td>
<td>-0.46</td>
<td>0.117747</td>
<td>44</td>
</tr>
<tr>
<td>Xiao J 2008</td>
<td>-0.765</td>
<td>1.69375232</td>
<td>313</td>
<td>0.465</td>
<td>4.96384</td>
<td>153</td>
</tr>
</tbody>
</table>

**Total (95% CI):** 473
- Heterogeneity: $\text{I}^2 = 3.44$, $df = 8$ ($P = 0.75$); $\text{I}^2 = 0$
- Test for overall effect: $Z = 33.28$ ($P < 0.0001$)

Fig. 2. The pooled effects of fenugreek on FBG, 2hBG and HbA1c in patients with prediabetes or DM. Forest plots comparing fenugreek treatment with control. (A) FBG; (B) 2hBG; (C) HbA1c.
Practical Application

• According to this study, approximately 6.3 g of fenugreek has been shown to decrease elevated FBG, 2-hr BG, and possibly HbA1c in those with type 2 diabetes mellitus or prediabetes.

• More studies must be conducted with better methodological designs in order to confirm efficacy and safety of fenugreek for diabetes.

Gong et al., 2016
Fenugreek Consumption Recommendations

• Dosage: 5 – 30 g capsules three times a day with meals
• Studies vary in amounts:
  • Powdered fenugreek seed 5-100 grams/day added to two meals/day for 4 days-3 years
  • Hydroalcoholic extract of the seeds = 1 g/day for 2 months
• Can potentially cause diarrhea, indigestion, and nausea.
Cinnamon

- Mixed/modest findings for improvements to blood glucose levels in pre-diabetic individuals
- Anti-microbial
- Anti-oxidant and anti-inflammatory (Shishehbor et al., 2018)
Origin

• Botanical name
  • *Cinnamomum verum*

• Major flavor compound
  • Cinnamaldehyde

• Region of cultivation
  • Native to Sri Lanka, cultivated in Myanmar, Vietnam, Indonesia, and islands of the Seychelles off the coast of East Africa.

• Parts used
  • Dried bark of tender shoots
Cinnamon extract improves fasting blood glucose and glycosylated hemoglobin level in Chinese patients with type 2 diabetes

Ting Lu, Hongguang Sheng, Johnna Wu, Yuan Cheng, Jianming Zhu, Yan Chen

Department of Endocrinology, Xuhui District Central Hospital, Shanghai, China
Clinical Medical College of Jiangsu University, Zhenjiang, Jiangsu Province, China
Key Laboratory of Nutrition and Metabolism, Institute for Nutritional Sciences, Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences, Shanghai, China
Purpose/Methods

• Purpose was to investigate benefits of cinnamon bark (cinnamon extract) on lowering blood glucose in patients with diabetes
• Double-blind clinical study with 66 patients in China
• Control, low dose (120 mg extract or about 1 teaspoon or 2 grams of dry cinnamon) and high dose (360 mg or about 3 teaspoons or 6 grams of dry cinnamon) random groups
• All patients took the medication gliclazide during the 3-month intervention

Lu et al., 2012
# Table 2 - Comparison of our study with other clinical studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Subject type</th>
<th>Country</th>
<th>Y</th>
<th>Dose/d</th>
<th>Form</th>
<th>Duration (wk)</th>
<th>FBG (mmol/L) Pre/Post</th>
<th>HbA1c (%) control treated Pre/Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khan et al [2]</td>
<td>Type 2 diabetes</td>
<td>Pakistan</td>
<td>2003</td>
<td>1-6 g</td>
<td>Cinnamon</td>
<td>5.5</td>
<td>n=10: 12.2 ± 1.0 / 10.4 ± 1.1</td>
<td>n=10: 13.0 ± 1.4 / 9.20 ± 1.5</td>
</tr>
<tr>
<td>Mang et al [3]</td>
<td>Type 2 diabetes</td>
<td>Germany</td>
<td>2006</td>
<td>6 g</td>
<td>Extract</td>
<td>16</td>
<td>n=32: 8.7 ± 1.9 / 6.3 ± 1.6</td>
<td>n=33: 9.3 ± 2.3 / 8.2 ± 1.7</td>
</tr>
<tr>
<td>Vanschoonbeek et al [11]</td>
<td>Type 2 diabetes</td>
<td>Netherland</td>
<td>2006</td>
<td>1.5 g</td>
<td>Cinnamon</td>
<td>6</td>
<td>n=13: 8.3 ± 1.2 / 5.0 ± 0.4</td>
<td>n=12: 8.4 ± 2.0 / 7.9 ± 2.5</td>
</tr>
<tr>
<td>Ziegenfuss et al [4]</td>
<td>Met. Syndrome</td>
<td>United States</td>
<td>2006</td>
<td>500 mg</td>
<td>Extract</td>
<td>12</td>
<td>n=10: 6.2 ± 0.6 / 6.3 ± 0.8</td>
<td>n=12: 6.4 ± 0.7 / 5.9 ± 1.1</td>
</tr>
<tr>
<td>Blevins et al [7]</td>
<td>Type 2 diabetes</td>
<td>United States</td>
<td>2007</td>
<td>2 g</td>
<td>Cinnamon</td>
<td>12</td>
<td>n=29: 8.0 ± 0.6 / NS</td>
<td>n=28: 7.4 ± 0.5 / NS</td>
</tr>
<tr>
<td>Roussel et al [9]</td>
<td>Impaired FBG</td>
<td>United States</td>
<td>2009</td>
<td>500 mg</td>
<td>Extract</td>
<td>12</td>
<td>n=11: 6.2 ± 0.2 / 6.3 ± 0.3</td>
<td>n=11: 5.7 ± 0.2 / 6.3 ± 0.1</td>
</tr>
<tr>
<td>Crawford [5]</td>
<td>Type 2 Diabetes</td>
<td>United States</td>
<td>2009</td>
<td>1 g</td>
<td>Cinnamon</td>
<td>12</td>
<td>n=46: N/A / N/A</td>
<td>n=43: N/A / N/A</td>
</tr>
<tr>
<td>Akilen et al [6]</td>
<td>Type 2 diabetes</td>
<td>United Kingdom</td>
<td>2010</td>
<td>2 g</td>
<td>Cinnamon</td>
<td>12</td>
<td>n=28: 8.8 ± 2.6 / 8.7 ± 3.1</td>
<td>n=30: 8.8 ± 3.5 / 8.0 ± 3.1</td>
</tr>
<tr>
<td><strong>This study</strong> a</td>
<td>Type 2 diabetes</td>
<td>China</td>
<td>2011</td>
<td>120 mg</td>
<td>Extract</td>
<td>13</td>
<td>n=20: 8.9 ± 1.2 / 8.7 ± 2.0</td>
<td>n=23: 9.0 ± 1.2 / 8.0 ± 1.1</td>
</tr>
</tbody>
</table>

The data of FBG and HbA1c are presented as means ± SD. N/A indicates not available; NS, the actual data were not given in the study but were not significantly different from pretreatment.

*a Only the data for low-dose group of our study are shown here.

* P < .05 between pre- and posttreatment as analyzed by paired t test.

** P < .01 between pre- and posttreatment as analyzed by paired t test.
Practical Application

- Cinnamon extract + gliclazide helped lower HbA1C (from 8.90% to 8.23% in the low-dose group and from 8.92% to 8.00% in the high-dose group).

- Cinnamon extract + gliclazide helped lower FBS (from 162 mg/dL to 144 mg/dL in the low-dose group and from 202 mg/dL to 173 mg/dL in the high-dose group).

- TG was significantly reduced in the low-dose group.

- Cinnamon can help as a supplementary therapy for hyperglycemia in individuals with type 2 diabetes. In this study, the water-soluble fraction of cinnamon was used.

Lu et al., 2012
**Cinnamon Consumption Recommendations**

- Active ingredient: proanthocyanidins (PACs)
  - < 1 mg to > 100 mg
- 1 g (½ tsp) of cinnamon bark powder/day; varies with extract
- Toxicity – possibility for liver toxicity in large doses
Special thanks to Alamelu Vairavan, author of *Healthful Indian Flavors with Alamelu* for sharing her love of cooking with Indian spices!
Curry – Background / Uses

- Curry powder is a blend of several different spices that vary by household. One common blend would be:
  - Coriander, fenugreek, cumin, black pepper, red chili pepper, and turmeric.
- Some blends come in a sweet or spicy blend. Spicy blends often contain more hot peppers and ginger.
Garam Masala – Background / Uses

• Originates from Northern India
  • Each household has its own variation of the spice
  • Blends can include:
    • Black cardamom seeds
    • Cassia, broken into pieces
    • Black peppercorns
    • Mace blades
    • Cloves
    • Nutmeg

Farrimond, 2018
References


