Table 1: A summary of some of the human clinical trials published in the last 10 years fitting the search terms herbal/plant/phytomedicine and asthma in the NCBI database

<table>
<thead>
<tr>
<th>Author (Year) Journal</th>
<th>Treatment</th>
<th>Comparator</th>
<th>Age</th>
<th>Gender</th>
<th>Study Population</th>
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<th>Outcomes</th>
<th>Results</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wong, E. L. (2009) J Altern Complement Med [52]</td>
<td>Herbal formula CUF2 as complementary therapy</td>
<td>ICS</td>
<td>7 - 15</td>
<td>N.A.</td>
<td>Asthmatic children</td>
<td>85 patients assigned to receive treatment or placebo; study duration – 6 months</td>
<td>Steroid dosage; disease severity score; lung function; blood markers</td>
<td>Similar improvements were seen in both groups</td>
<td>No evidence to support the use of CUF2 in childhood asthma</td>
</tr>
<tr>
<td>Lindemann, J. (2009) Curr Med Res Opin [53]</td>
<td>EFF1009 (gamma-linolenic acid &amp; eicosapentaenoic acid) &amp; current asthma medication</td>
<td>Placebo &amp; current asthma medication</td>
<td>N.A.</td>
<td>N.A.</td>
<td>Mild to moderate persistent adult asthmatics</td>
<td>Study duration – 28 days</td>
<td>Asthma symptom scores; disease control; ACQ</td>
<td>FEV improved in treatment group when compared to comparator; no difference in ACQ results between the groups</td>
<td>EFF1009 can improve lung function and disease management</td>
</tr>
<tr>
<td>Watson, R. R. (2008) Nutr Res [54]</td>
<td>Purple passion fruit peel (PFP) extract</td>
<td>Placebo</td>
<td>T: 36 ± 16 C: 36 ± 12</td>
<td>T: 9M 13F C: 7M 14F</td>
<td>Asthmatics aged 18 - 60</td>
<td>Parallel-group study; study duration – 4 weeks</td>
<td>Symptoms; spirometry</td>
<td>PFP reduced cough, wheeze and shortness of breath; no changes in symptoms were observed in comparator group; PFP improved FVC but not FEV</td>
<td>PFP is a safe alternative therapy to reduce asthma symptoms</td>
</tr>
<tr>
<td>Boskabady, M. H. (2007) Fundam Clin Pharmacol [55]</td>
<td>Boiled extract of Nigella sativa</td>
<td>Placebo</td>
<td>T: 36 ± 13 C: 48 ± 12</td>
<td>T: 4M 11F C: 2M 12F</td>
<td>Moderate to severe asthmatics</td>
<td>29 patients divided into two groups; study duration – 3 months</td>
<td>Symptom scores; severity &amp; frequency of symptoms; lung function</td>
<td>Symptom scores improved in treatment group as did severity and frequency of symptoms and lung function. Treatment group also showed less need for steroids and β2 antagonists</td>
<td>Results suggest a prophylactic effect of N. sativa on asthma</td>
</tr>
<tr>
<td>Thomas, M. (2007) BMC Pulm Med [56]</td>
<td>AKL1, a combination of botanical components, add-on therapy</td>
<td>Placebo &amp; current asthma medication</td>
<td>41 ± 15</td>
<td>18M 25F</td>
<td>Persistent asthmatics currently receiving ICS</td>
<td>43 patients divided into two groups; cross-over study; study duration – 12 weeks</td>
<td>PEFR; symptom scores; spirometry; ACQ</td>
<td>No difference in lung function between groups however the treatment group showed improved ACQ results</td>
<td>AKL1 is well tolerated in asthma patients and improves QOL however it has no effect on lung function</td>
</tr>
<tr>
<td>Author (Year) Journal</td>
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<tr>
<td>Chan, C. K. (2006) <em>Pediatr Allergy Immunol</em> [57]</td>
<td>Ding Chuan Tang</td>
<td>Placebo</td>
<td>8 - 15</td>
<td>T: 19M 9F C: 12M 12F</td>
<td>Mild to moderate persistent asthma with a history of 1 – 9 years</td>
<td>58 patients divided into two groups; parallel study; study duration – 12 weeks</td>
<td>Symptom scores; medication scores; AM &amp; PM PEFR; lung function; methacholine challenge; serum inflammatory mediators</td>
<td>Airway hyper-responsiveness significantly improved in treatment group compared to comparator group; no difference in lung function between the two groups</td>
<td>Ding Chuan Tang may improve hyper-responsiveness although had no bronchodilating effect</td>
</tr>
<tr>
<td>Murali, P. M. (2006) <em>Respiration</em> [58]</td>
<td>DCBT4567-Asthma-15 plant based formula</td>
<td>Oral salbutamol; salbutamol &amp; theophylline; placebo</td>
<td>15 - 50</td>
<td>Each group 55 – 65% female</td>
<td>Moderate asthma with stable symptoms</td>
<td>94 patients divided into four groups; study duration – 12 weeks</td>
<td>End point = 15% improvement in FEV; dyspnoea; wheezing; cough; expectoration; disability; sleep disturbances; respiratory rates</td>
<td>All groups other than placebo, had a 15% improvement in FEV. Symptoms were significantly reduced in treatment group compared to comparator groups</td>
<td>DCBT is as efficacious as salbutamol and has a significantly better effect on QOL</td>
</tr>
<tr>
<td>Wen M. C. (2005) <em>J Allergy Clin Immunol</em> [26]</td>
<td>ASHMI &amp; placebo</td>
<td>Prednisone &amp; placebo</td>
<td>T: 47 ± 11 C: 45 ± 12</td>
<td>T: 21M 24F C: 19M 27F</td>
<td>Non-smokers with moderate to severe, persistent, atopic asthma</td>
<td>92 patients divided into two groups; study duration – 4 weeks</td>
<td>Spirometry; symptom scores; side effects; serum cortisol, cytokines and IgE levels</td>
<td>Lung function improved in both groups however the comparator group showed significantly larger improvements; Symptom scores, β2 antagonist, serum IgE and Th2 cytokines levels were reduced in both groups; IFNγ and cortisol levels were lowered in comparator group but increased in treatment group</td>
<td>ASHMI intervention is a safe and effective therapy for asthma and exhibits modulatory effects on Th1/Th2 balance in asthma patients</td>
</tr>
</tbody>
</table>

**Randomised studies**

<p>| Li, S. (2013) <em>J Tradit Chin Med</em> [59] | Chinese medicine (details N.A.) | Leukotriene receptor antagonist &amp; bronchial relaxant | N.A. | N.A. | Asthmatic children | 75 patients divided into two groups | IL4, cysLTR1, IFNγ mRNA levels; IL4, IFNγ, LTE4 levels in blood | Significant decrease in IL4 and cysLTR1 mRNA and increase in IFNγ mRNA in both groups. No significant difference between group changes; Significant decrease in blood IL4 and significant increase in blood IFNγ in treatment group. No change in LTE4 levels in either group | Chinese medicine has effect on leukotriene expression levels and Th1/Th2 imbalance in asthma patients |</p>
<table>
<thead>
<tr>
<th>Author (Year)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Tang, B. (2013)</td>
<td><em>J Tradit Chin Med</em> [60]</td>
<td>“Yang – warming and kidney essence-replenishing” herbal paste &amp; standard treatment</td>
<td>Standard treatment</td>
<td>T: 41 ± 12 C: 43 ± 12</td>
<td>T: 31M 44F C: 38M 40F</td>
<td>Moderate to severe persistent asthma &amp; kidney deficiency syndrome</td>
<td>151 patients divided into two groups; controlled study; study duration – 8 weeks</td>
<td>Cold &amp; cold-related exacerbations; symptom scores; kidney deficiency syndrome</td>
<td>Frequency, duration and severity of cold and cold-related exacerbations were significantly lower in treatment group; Kidney deficiency syndrome was also significantly improved in treatment group; No difference in symptom scores between groups</td>
<td>“Yang-warming and kidney essence-replenishing” herbal paste could reduce cold-related asthma exacerbations</td>
</tr>
<tr>
<td>Miao, Q. (2013)</td>
<td><em>Chin J Integr Med</em> [61]</td>
<td>Chinese medicine – details N.A.</td>
<td>Montelukast &amp; theophylline</td>
<td>N.A.</td>
<td>N.A.</td>
<td>Cough variant asthma</td>
<td>94 patients assigned to treatment and comparator groups in 2:1 ratio</td>
<td>Syndrome efficacy – details of scores N.A.; cough efficacy – details N.A.; symptom scores; airway responsiveness</td>
<td>Treatment group showed 90.57% syndrome efficacy compared to 76.92% in comparator group, this difference is significant; Treatment group showed 98.11% cough efficacy compared to 80.77% in comparator group, this difference is significant; symptom scores were significantly improved in the treatment group compared to comparator; airway responsiveness was unchanged in both groups</td>
<td>Chinese medicine may help ease asthma and its related symptoms</td>
</tr>
<tr>
<td>Tahan, F. (2013)</td>
<td><em>Phytomedicine</em> [62]</td>
<td>Pelargonium sidoides root extract &amp; paracetamol (when needed)</td>
<td>Paracetamol (when needed)</td>
<td>T: 1 – 12 C: 1 - 14</td>
<td>T: 15M 15F C: 19M 12F</td>
<td>Mildly asthmatic children aged 1 – 14 presenting with an upper respiratory viral infection</td>
<td>61 patients divided into two groups; P. sidoides drops taken 3 times daily for 5 days</td>
<td>Number of exacerbations and symptoms during upper respiratory tract infection</td>
<td>Significant improvement in cough and nasal congestion in treatment group but no differences in fever or muscle ache between groups; fewer exacerbations were experienced in treatment group</td>
<td>Pelargonium sidoides root extract may reduce exacerbations by shortening duration of infection as seen through improved cough and nasal congestion</td>
</tr>
<tr>
<td>Belcaro, G. (2011)</td>
<td><em>Panmininerva Med</em> [63]</td>
<td>Pycnogenol, an extract from French maritime pine bark &amp; ICS</td>
<td>ICS only</td>
<td>N.A.</td>
<td>N.A.</td>
<td>Stable, controlled allergic asthmatics</td>
<td>Study duration – 6 months; 76 patients were divided into two groups; treatment group received two 50 mg doses on Pycnogenol daily</td>
<td>ICS dosage; night waking; symptom scores; need for other medication</td>
<td>Decrease in ICS dosage in treatment group with no deterioration of asthma control whereas 18% of comparator group required an increase in ICS dosage; less night wakennings, decreased symptom scores and less need for other medication was observed in treatment group when compared to comparator group</td>
<td>Pycnogel improved asthma control and reduced the need for increased medication dose</td>
</tr>
<tr>
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<tr>
<td>Park, C. S.</td>
<td>Korean J Intern Med [50]</td>
<td>Combination of NDC-052, an extract from the herb Magnoliae flos, &amp; ICS</td>
<td>None</td>
<td>45 ± 14</td>
<td>56M 92F</td>
<td>Mild to moderate adult asthma patients with symptom history of &gt;3 months</td>
<td>Multi-centre study; study duration – 8 weeks; 148 patients</td>
<td>FEV; AM &amp; PM PEFR; AM &amp; PM symptom scores; visual analogue symptom score; night waking; frequency of β2 antagonist use</td>
<td>AM &amp; PM PEFR improved; symptom scores, night wakenings and β2 antagonist use decreased</td>
<td>Addition of NDC-052 is beneficial when used alongside ICS treatment</td>
</tr>
<tr>
<td>Kalhan, R.</td>
<td>Clin Exp Allergy [64]</td>
<td>Soy isoflavone genistein (In vitro: eosinophil stimulation in the absence of genistein; in vivo: high soy diet)</td>
<td>In vitro: blood taken from patients with history of atopic disease &amp; a peripheral eosinophilia of &gt;3% In vivo: Asthmatics aged 18 - 65</td>
<td>38 ± 12</td>
<td>6M 7F</td>
<td></td>
<td>In vitro: Randomisation and blinding not mentioned; study duration – 4 weeks</td>
<td>In vivo: LTC4 synthesis; 5-lipoxygenase nuclear translocation; MAPK activation In vivo: FE(NO) Ex vivo: LTC4 synthesis</td>
<td>In vitro: Genistein inhibited LTC4 synthesis, blocked the phosphorylation of p38 and its downstream targets and reduced 5-lipoxygenase translocation In vivo: LTC4 synthesis and FE(NO) were decreased in treatment group compared to the comparator group</td>
<td>Genistein inhibits LTC4 synthesis at physiologically relevant concentrations possibly via blocking p38-induced translocation of 5-lipoxygenase</td>
</tr>
<tr>
<td>Hoang et al.</td>
<td>Phytother. Res. [65]</td>
<td>Sophora flavescens root extract</td>
<td>None</td>
<td>22 - 70</td>
<td>6M 8F</td>
<td>Moderate to severe asthma</td>
<td>Selective study; study duration – 3 years</td>
<td>Symptom diary; PEF; medication use; QOL</td>
<td>Compared to measurements taken before study patients saw a 97% reduction in daytime symptoms, 98% reduction in night time symptoms, 97% dose reduction in β2 agonists, 100% reduction in corticosteroid use, 21% increase in PEF</td>
<td>S. flavescens demonstrated dramatic clinical and functional results in asthma patients and is highly effective without the development of tolerance, side effects or the need for increased dosages</td>
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<tr>
<td><strong>Double-blind, randomised controlled studies</strong></td>
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<tr>
<td>Guo, S. (2014)</td>
<td>Bu-fei granules</td>
<td>Placebo</td>
<td>40 - 75</td>
<td>N.A.</td>
<td>Stable COPD with deficiency of lung, spleen and kidney accompanied with phlegm retention and blood stasis</td>
<td>140 patients divided into two groups; multicentre clinical study; study duration – 12 weeks</td>
<td>Frequency of exacerbations; lung function; serum inflammatory mediators</td>
<td>All measurements taken were significantly better in treatment group when compared to comparator group except for IL6 levels in serum</td>
<td>Bufei granules reduces the frequency of COPD exacerbations, improves QOL and attenuates systemic inflammation</td>
</tr>
<tr>
<td>Liu, M. (2014)</td>
<td>Xuan Bai Cheng Qi formula &amp; current medication</td>
<td>Placebo &amp; current medication</td>
<td>18 - 85</td>
<td>T: 88M 34F C: 82M 40F</td>
<td>COPD patients with the syndrome type of phlegm-heat obstructing the lungs</td>
<td>244 patients divided into two groups; multicentre study; study duration – 10 days</td>
<td>Symptom scores; lung function; arterial blood gas; serum inflammatory cytokines; oxidation &amp; antioxidation index</td>
<td>Symptom scores and lung function were significantly improved in treatment group compared to comparator group; PaO2 &amp; PaCO2 were improved in treatment group; cytokine levels and oxidation/antioxidation index were lower in treatment group than comparator group</td>
<td>Xuan Bai Cheng Qi is a safe and effective ad-on therapy for COPD</td>
</tr>
<tr>
<td>Xie, Y. (2013)</td>
<td>Bu-fei Yishen &amp; Shufei Tie acupoint sticking therapy &amp; placebo</td>
<td>Oral Theophylline &amp; placebo acupoint sticking therapy</td>
<td>N.A.</td>
<td>N.A.</td>
<td>Stable COPD</td>
<td>244 patients divided into two groups; multicentre, double-dummy study; study duration – 4 months</td>
<td>QOL questionnaire</td>
<td>Treatment group experienced less exacerbations and lower in the physiological, psychological and social aspects of QOL questionnaire</td>
<td>Bu-fei Yishen &amp; acupoint sticking therapy appears safe and improves the QOL of COPD patients</td>
</tr>
<tr>
<td>Li, J. S. (2012)</td>
<td>Bu-Fei Yi-Shen granules &amp; acupoint sticking therapy &amp; oral placebo</td>
<td>Oral theophylline &amp; placebo acupoint sticking therapy</td>
<td>T: 67 ± 10 C: 66 ± 8</td>
<td>T: 76M 42F C: 71M 45F</td>
<td>Stable COPD with lung-kidney qi deficiency</td>
<td>244 patients divided into two groups; multicentre, double-dummy study; study duration – 2 months</td>
<td>Frequency &amp; duration of exacerbations; lung function; symptom scores; 6 min walking distance; dyspnoea; QOL</td>
<td>The treatment group experienced fewer &amp; shorter duration of exacerbations than the comparator group; symptom scoresand QOL improved more in treatment group than in comparator group; no significant difference in lung function between the two groups</td>
<td>Bu-Fei Yi-Shen can improve QOL and decrease the number of exacerbations experienced by COPD patients</td>
</tr>
<tr>
<td>Author (Year)</td>
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<tr>
<td>Isbaniah, F. (2011)</td>
<td>J Clin Pharm Ther [69]</td>
<td>1. Echinacea purpurea &amp; ciproflaxin OR 2. Echinacea purpurea &amp; ciproflaxin &amp; selenium &amp; ascorbic acid</td>
<td>Ciproflaxin &amp; placebo</td>
<td>&gt;40</td>
<td>Mostly male</td>
<td>COPD with an acute exacerbation episode</td>
<td>120 patients divided into three groups; single-centre, three-armed, parallel-group study; study duration – 2 weeks</td>
<td>Serum TNFα, IL1β, IL6, IL10; symptom scores</td>
<td>Treatment group 2 experience fewer and shorter exacerbations than the other groups following an infective exacerbation; changes in serum inflammatory mediator levels appeared to be unrelated to treatment</td>
</tr>
<tr>
<td>Worth, H. (2009)</td>
<td>Respir Res [70]</td>
<td>Cineole</td>
<td>Placebo</td>
<td>T: 62 ±9  C: 63 ± 10</td>
<td>T: 66M 44F  C: 75M 35F</td>
<td>Stable stage 2 and 3 COPD</td>
<td>242 patients divided into two groups; multicentre study; study duration – 6 months</td>
<td>Frequency, duration &amp; severity of exacerbations; lung function; symptom scores; QOL</td>
<td>Frequency, duration and severity of exacerbations were significantly improved in the treatment group compared to comparator group; lung function, symptom scores and QOL were also significantly in treatment group compared to comparator group</td>
</tr>
<tr>
<td>Cerda, B. (2006)</td>
<td>Eur J Clin Nutr [71]</td>
<td>Pomegranate juice (polyphenol)</td>
<td>Placebo</td>
<td>T: 60 ±11  C: 63 ± 9</td>
<td>N.A.</td>
<td>Stable COPD</td>
<td>30 patients divided into two groups; study duration – 5 weeks</td>
<td>Blood parameters; lung function; bioavailability of polyphenols in blood &amp; urine; urinary isoprostane</td>
<td>No polyphenols were detected in the blood or urine of either group; no differences seen in blood parameters or lung function in either group</td>
</tr>
<tr>
<td>Murali, P. M. (2006)</td>
<td>Respir Med [72]</td>
<td>DCBT1234-lung KR (plant-based formula)</td>
<td>Placebo or salbutamol &amp; theophylline bromhexine</td>
<td>35 - 85</td>
<td>N.A.</td>
<td>Moderate, stable COPD</td>
<td>105 patients divided into two groups; study duration – 24 weeks</td>
<td>Lung function; arterial blood gases; symptom scores</td>
<td>DCBT significantly improved FEV1 &amp; PaO2 when compared to comparator groups; dyspnoea, cough &amp; wheeze, were improved in all groups apart from placebo groups</td>
</tr>
<tr>
<td>Zhao, Y. L. (2012)</td>
<td>J Tradit Chin Med [73]</td>
<td>Chinese Yam &amp; epimedium &amp; current treatment</td>
<td>Placebo &amp; current treatment</td>
<td>T: 80 ± 9  C: 81 ± 7</td>
<td>46M 3F</td>
<td>Moderate or severe COPD</td>
<td>49 patients divided into two groups; study duration – 3 months</td>
<td>BMI; airway obstruction; dyspnoea; exercise capacity; symptom scores</td>
<td>Significant improves were seen in the treatment group in dyspnoea, symptom scores and exercise tolerance but not in comparator group</td>
</tr>
</tbody>
</table>

**Randomised, controlled studies**


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<thead>
<tr>
<th>Author (Year)</th>
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</table>
C: 65 ± 6 | T: 17M  
15F  
C: 17M  
16F | Patients with mild or moderate COPD and lung and kidney qi deficiency and blood stasis | 70 patients divided into two groups; study duration – 12 weeks | FEV; FEV1/FVC; symptom scores | Symptoms scores were significantly lower in both groups but the treatment group showed a larger improvement than the comparator group; FEV was higher in both groups | Yiqibushenhuoxue may help relieve symptoms of COPD |
C: 64 ±9 | T: 122M  
54F  
C: 131M  
43F | Mild to severe, stable COPD patients | 352 patients divided into two groups; study duration – 6 months | Symptom scores; QOL | Cough, sputum, chest tightness, shortness of breath were improved in both treatment groups compared to comparator groups; Total symptom scores were improved in treatment groups rather than comparator group; QOL was better in treatment groups than comparator group | Herbal treatments had beneficial effects on QOL in COPD patients |
C: 64 ± 9 | T: 122M  
54F  
C: 131M  
43F | Mild to severe, stable COPD patients with lung-spleen and lung-kidney qi deficiency and lung-kidney qi and yin deficiency | 352 patients divided into two groups; multicentre, open-label study; study duration – 6 months | Frequency & duration of exacerbations; lung function; symptom scores; 6 minute walking distance; dyspnoea; QOL | Treatment group experienced significantly less exacerbation and duration of exacerbations was shorter than the comparator group; treatment group showed improved FEV, symptom scores, 6 min walking distance, dyspnoea and QOL in comparison to comparator group; FVC and FEV% remained the same in both groups | Traditional Chinese medicine has a beneficial effect on symptoms and the QOL in COPD patients |
N.A. | Acute exacerbation COPD | 90 patients divided into three groups; study duration – 10 days | Symptom scores; plasma IL8 & neutrophil elastase | Symptom scores improved in treatment when group when compared to the group receiving conventional medicine only; IL8 levels decreased in all groups however there was significant difference between the groups; neutrophil elastase decreased the most in the group receiving ambroxol hydrochloride & conventional medicine however the difference amongst the groups was not significant | Tanreqing injection as an ad-on therapy can help improve COPD symptoms possibly via decreasing IL8 and neutrophil elastase levels |
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<tr>
<td>Shinozuka, N. (2007) J Am Geriatr Soc [76]</td>
<td>Hochuekkito &amp; bronchodilators</td>
<td>Bronchodilators</td>
<td>73 ± 1</td>
<td>N.A.</td>
<td>Stable COPD</td>
<td>35 patients divided into two groups; study duration – 6 months</td>
<td>FEV1 % predicted; serum inflammatory mediators</td>
<td>C reactive protein and TNFα levels decreased in treatment group whereas no change was seen in comparator group</td>
<td>Hochuekkito may reduce systemic inflammation in COPD patients</td>
</tr>
</tbody>
</table>

Table 3: A summary of the herbal compounds mentioned in some of the human clinical trials published in the last 10 years and their beneficial effects in patients with asthma and COPD.

<table>
<thead>
<tr>
<th>Effect</th>
<th>Herbal Compound</th>
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<tr>
<td>Anti-inflammatory</td>
<td><em>Magnolia flos</em>; pycnogenol; EFF 1009; PFP extract; <em>Nigella sativa</em>; Akl1; ASHMI; Bufei granules; Xuan Bai Cheng Qi; Tanreqing; Hochuekkito.</td>
</tr>
<tr>
<td>Anti-oxidant</td>
<td>Pycnogel; PFP extract; soy isoflavone genistein; Xuan Bai Cheng Qi; polyphenol.</td>
</tr>
<tr>
<td>Antimicrobial</td>
<td><em>Pelargonium sidoides</em>.</td>
</tr>
<tr>
<td>Cough/symptom suppressant</td>
<td>PFP extract; <em>Nigella sativa</em>; Akl1; Ding Chuan Tang; DCBT4567 – astha – 15; Yiqibushenhuoxue; Bufei granules; <em>Echinacea purpurea</em>; Tanreqing; Cineole.</td>
</tr>
<tr>
<td>Smooth muscle relaxant</td>
<td><em>Nigella sativa</em>; <em>Sophora flavescens</em>; DCBT.</td>
</tr>
<tr>
<td>Decongestant/expectorant</td>
<td>Ding Chuan Tang; Cineole.</td>
</tr>
</tbody>
</table>