Alfalfa

Synonyms / Common Names / Related Terms
Al-fac-facah, arc, alfalfa weevil, buffalo herb, California clover, Chilean clover, Fabaceae (family), feuille de luzerne, isoflavone, jatt, kaba yonca, Leguminosae (family), lucerne, medicago, mielga, mu su, phytoestrogen, purple medic, purple medick, purple medicle, sai pi li ka, saranac, Spanish clover, team, weevelchek, yonja.

Mechanism of Action

Pharmacology:
- Constituents: Vitamins A, C, E, and K, minerals, and trace elements are present in alfalfa. The amounts of each are unclear, and any benefits or toxicities due to these constituents remain unknown. Alfalfa contains coumestrol, a phytoestrogen that has been isolated from three commercially available alfalfa products, and in vitro may have a role as a low-density lipoprotein (LDL) antioxidant. Alfalfa saponins rather than alfalfa fiber appear to be responsible for the reduction of cholesterol absorption. Flavonoids have also been isolated from alfalfa. Manganese, found in relatively high concentrations in alfalfa, has been proposed as a possible cause of hypoglycemia in one case-report. Immunoreactive thyrotropin-releasing hormone-like material has been found in alfalfa in significant amounts, although its biological action is unknown. 1, 2-dimethylhydrazine, a carcinogen, binds to alfalfa when colon pH is between 10.5-12, and alfalfa has been proposed as possessing protective properties against chemically-induced colon cancer.

- Anti-microbial effects: Alfalfa may possess anti-microbial properties. G2, 2-beta-hydroxy-3-beta-O-(beta-D-glucopyranosyl)-delta 12-oleanene-23, 28-dionic acid, has been isolated from alfalfa roots and has been shown in vitro to possess a high degree of activity against Cryptococcus neoformans (MIC 2µg/mL). G2 exhibits activity against a wide range of yeast strains, and appears to induce lethal ion leakage from yeast cells. Medicagenic acid, hederagenin glycosides, and soyasapogenols may contribute to the antifungal actions of alfalfa, including against Aspergillus niger, Candida albicans, and Candida tropicalis.

- Cholesterol-lowering effects: A study in monkeys found that monkeys fed alfalfa saponins had decreased cholesterolemia without changes in high-density lipoprotein (HDL) when compared to monkeys not fed alfalfa saponins. It was also noted that alfalfa saponins decrease intestinal absorption and increase fecal excretion of cholesterol, a finding also reported in rats. Alfalfa has been shown to prevent the expected rise in cholesterol associated with intake of a high cholesterol diet in monkeys. Alfalfa reduces lipid levels in plasma and tissues more effectively than D-thyroxine and pyrimidine, but not as effectively as cholestyramine or diets completely void of cholesterol. Similar cholesterol-lowering effects have been observed in rabbits. Rabbits with an ileal bypass required less alfalfa to prevent hypercholesterolemia than rabbits with
normal gut length\(^2\), alfalfa was an effective adjuvant to partial ileal bypass in the treatment of hypercholesterolemia in rabbits.\(^2\) Following oral administration of cholesterol to rabbits, elevations in serum cholesterol were prevented when feedings included alfalfa.\(^2\) Hyperlipidemia-induced rabbits fed alfalfa were found to have lower total cholesterol, specifically triglycerides and non-esterified fatty acids, when compared to rabbits not fed alfalfa.\(^12\) A study in 72 monkeys showed that diets consisting of alfalfa and cholesterol reduced cholesterol levels and atherosclerotic plaque formation when compared with diets containing cholesterol alone.\(^2\),\(^6\)

- Hypoglycemic effects: Alfalfa has been found to significantly lower basal plasma glucose concentrations in streptozotocin diabetic mice.\(^7\) In a different study, streptozotocin diabetic mice fed alfalfa (62.5g/kg in the diet and 2.5g/L in drinking water) experienced reduced hyperglycemia when compared with normal mice.\(^8\) The hypoglycemic actions of alfalfa have been postulated to be due to the potentiation of insulin secretion and improvement of insulin action, although human data in this area is limited.

- Immunologic effects: The alfalfa constituent L-canavanine, an amino acid, has been associated in animals and humans with the development of a lupus-like syndrome, or exacerbation of systemic lupus erythematosus (SLE).\(^5\),\(^14\),\(^15\) In vitro, alfalfa appears to act on CD8 (-) Leu8 (+) T cells to regulate antibody synthesis and proliferation.\(^13\) L-canavanine may exert an inhibitory effect on CD8 T cells,\(^15\) and may also exert effects on mononuclear cells.\(^14\) The mechanism of action remains unknown. An unsaponifiable substance extracted from alfalfa appeared to be beneficial in treating skin damage secondary to radiotherapy and healing gums after orthodontist operations. The substance contained cycloartenol, sitosterol, campestrol, and stigonosterol.\(^2\)

**Pharmacodynamics/Kinetics:**

- In a rat toxicity study, alfalfa was shown to significantly increase the activity of the hepatic enzyme, aminopyrine N-demethylase.\(^2\) It did not affect glutathione S-transferase or epoxide hydrolase activities.

**References**

15. Alcocer-Varela, J., Iglesias, A., Llorente, L., and Alarcon-Segovia, D. Effects of L-canavanine on T cells

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