

# Clinical study on the therapeutic effects of *Quercus infectoria* galls as oral powder in gingivitis and plaque patients

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## Abstract

Gingivitis is a nondestructive disease that causes inflammation of the gums and is one of the most common periodontal diseases. The cause of inflammation is bacterial biofilm, known as the plaque, on the surface of the teeth. The plaque is the main cause of periodontal disease; if left untreated, gingivitis can develop into inflammation of the tooth, where inflammation of the gums destroys the bones, causes tissue erosion around the teeth and can lead to loss of tooth. *Q. infectoria* were applied topically to ten people aged 25-55 who were suffering from gingivitis and plaque. Diagnoses and follow-up treatment were performed in a dental clinic under the supervision of a dentist for a period of two weeks. We noted the great efficacy of the herb against gingivitis and plaque. The progress of plaque measured in terms of mean, population standard deviation and variance were 0.66 , 0.17, 0.02 before treatment and 0.29, 0.12, 0.01 after treatment. Gingival progress before and after treatment were 0.72 , 0.15 , 0.02 and 0.32 , 0.11 , 0.01 , respectively. According to results were due to the fact that *Q. infectoria* contain large amounts of tannin and other compounds that constrict vessels and tissues and are effective against various types of infections. Therefore, we recommend them as an alternative to antibiotics. Effectiveness of *Q. infectoria* as an effective substance to inhibit the growth of oral bacteria and thus act as an anti-inflammatory and retention of gum tissue where the substance was tested directly on patients have Plaque and gingivitis and we can recommend them as an alternative to antibiotics

**Keywords:** *Q. infectoria*, gingivitis, plaque, tannin, bacterial.

## Introduction

Gingivitis is a non-destructive disease which occurs around the teeth. The most common form of gingivitis and periodontal disease, overall, occur in response to bacterial biofilms that are attached to tooth surfaces and are termed plaque-induced gingivitis<sup>1</sup>.

While some cases of gingivitis never progress to periodontitis, data indicates that periodontitis is always

preceded by gingivitis<sup>2</sup>.

Gingivitis is reversible with good oral hygiene; however, if left untreated, gingivitis can progress to periodontitis, in which the inflammation of the gums results in tissue destruction and bone resorption around the teeth. Periodontitis can ultimately lead to loss of teeth. The term means “inflammation of the gum tissue”<sup>3</sup>.

Antimicrobial agents are vastly used today, which can result in changes in mouth microbiota and cause teeth staining by chlorhexidine mouth rinse<sup>4</sup>. Moreover, oral bacteria have been shown to increase resistance towards most antibiotics such as penicillin, tetracycline, erythromycin, cephalosporin, and metronidazole which are used therapeutically to treat oral infection<sup>5</sup>. The resistance to most antibiotics has led researchers to

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search for anti-infective herbal compounds that can be used to effectively treat oral diseases <sup>6</sup>. Most people in developing countries nowadays use traditional medicines for their health care and recovery <sup>7</sup>. Medicinal plants produce biologically active compounds and this is common in most compounds extracted from plants. *Q. infectoria* is one of the most widely used traditional medicines in Asia found in Cyprus, Syria, Turkey and Greece.

*Q. infectoria* is a small tree with a height of about 2 meters <sup>8,9</sup>. The main constituents of the galls are gallic acid (2–4%), Gallo tannic acid (50–70%), ellagic acid, starch, and sugar <sup>10</sup>. Galls in traditional Malaysian medicine have been used to stimulate vaginal muscle contraction as well as to restore uterine flexibility after birth <sup>11</sup>. while in traditional Indian medicine it was used as a toothpaste to treat gum disease and oral cavity <sup>12</sup>. It has also been used to treat internal bleeding, impetigo, gonorrhoea, diarrhoea, tonsillitis and menstruation. It also possesses antibacterial, antiviral, pesticidal, fungal, and anti-inflammatory properties<sup>13,14</sup>.

### Materials and Methods

#### Plant Materials

- The galls of *Q. infectoria* were purchased from the market and used as plant materials for this study
- The specimen was diagnosed and identified by a teacher specialized in plant classification science.
- The product was crushed to small pieces using a sterile pestle and mortar and powdered in an electric grinder.
- The powder was put in plastic containers .
- Patients were diagnosed by a specialist dentist

in the private clinic and the cans were then delivered to each of them.

- The topical powder was used by the patient twice a day, in the morning and before bedtime.
- The patients were reviewed at the doctor’s clinic after two weeks of using the products and the results were recorded by a personal physician.

The LD50 was determined using the classical LD50 method of Behrens and Karbers (1953). No side effects have been reported for using this product in the various studies that have worked.

### Results

To the best of our knowledge, this is first clinical study that showed the effect of galls of *Q. infectoria* extracts on people who have both gingivitis and plaque.

Ten people (nine women and one man) participated in this study. Participants were aged 25 to 55 years, and all of them had gingivitis and plaque (Table 1 and 2). All patients used equal quantities of galls of *Q. infectoria* extracts as powder for two weeks. The progress of plaque in terms of mean, population standard deviation and variance measured before and after treatment were 0.66 , 0.17, 0.02 and 0.29, 0.12, 0.01, respectively (Figure1). On the other hand, the progress of gingivitis before and after treatment were 0.72 , 0.15 , 0.02 and 0.32 , 0.11 , 0.01 for mean, population standard deviation and variance, respectively (Figure 2).

All observation and diagnosis took place in a private dental clinic under the supervision of a specialist dentist according to the standards of Plaque Index (Silness & Loe, 1964) and Gingival Index (Silness & Loe, 1963).

**Table 1. Comparison of group of plaque patients before and after treatment with *Q. infectoria*.**

No.	Age	Gender	Before	After
1	25	Female	0.75	0.26
2	28	Female	0.59	0.28
3	30	Female	0.57	0.2
4	32	Female	0.29	0.16

**Cont... Table 1. Comparison of group of plaque patients before and after treatment with *Q. infectoria*.**

5	55	Female	0.9	0.1
6	26	Female	0.5	0.3
7	33	Female	0.8	0.5
8	44	Female	0.73	0.25
9	29	Female	0.66	0.5
10	34	Female	0.84	0.36

**Table 2. Comparison of group of gingivitis patients before and after treatment with*****Q. infectoria***

No.	Age	Gender	Before	After
1	31	Female	0.8	0.3
2	33	Male	0.9	0.3
3	40	Female	0.76	0.37
4	44	Female	0.93	0.1
5	52	Female	0.8	0.29
6	32	Female	0.56	0.32
7	45	Female	0.6	0.4
8	36	Female	0.7	0.5
9	29	Female	0.39	0.22
10	25	Female	0.83	0.49

**Discussion**

High amounts of hydrolysable tannin present in the galls of *Q. infectoria* imply that tannin may be the active compound responsible for the antibacterial activity in this study. Tannins in the galls were reported to possess antibacterial property against common pathogens such as *Enterococcus faecalis*, *Streptococcus pyogenes*, and *Bacillus cereus*<sup>15,16</sup>. A number of mechanisms have been proposed to explain the antibacterial activity shown by tannin, including complex formation between tannin and microbial enzymes (such as cellulase) as well as membrane of microorganism due to the

astringent properties of tannin, iron deprivation through precipitation and effect on bacterial metabolism through inhibition of oxidative phosphorylation<sup>17</sup>. Several studies have shown that galls of *Q. infectoria* possess manifold therapeutic activities, with particular efficacy against inflammatory diseases. These results suggest that alcoholic extract of galls of *Q. infectoria* exerted in-vivo have anti-inflammatory activity after oral or topical administration and also have the ability to curb the production of some inflammatory mediators<sup>18</sup>.

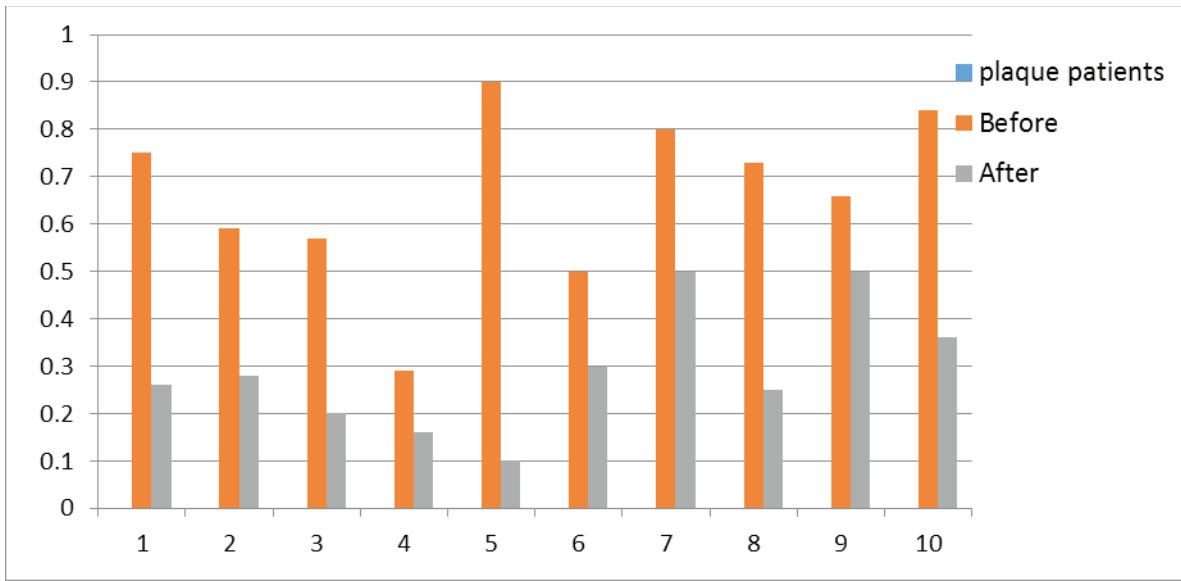


Figure 1. Comparison of group of plaque patients before and after treatment with *Q. infectoria*.

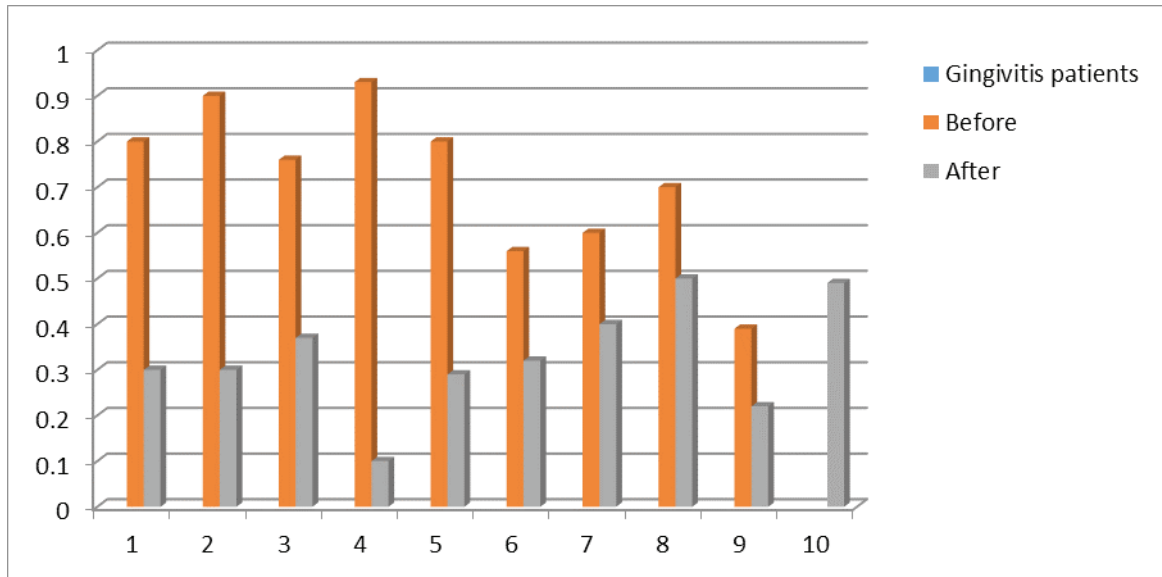


Figure 2. Comparison of group of gingivitis patients before and after treatment with *Q. infectoria*.

### Conclusion

The results of this study proved the effectiveness of *Q. infectoria* as an effective substance for inhibiting the growth of oral bacteria. *Q. infectoria* acted as an anti-inflammatory agent and improved retention of gum tissue when the substance was tested directly on patients diagnosed with plaque and gingivitis, under the supervision of a dental specialist.

The results of present study support the traditional usage of *Q. infectoria* and plant extracts which possess compounds with antibacterial properties.

Therefore, we recommend *Q. infectoria* as an alternative to antibiotics. Also, we recommend additional studies on the use of this product on a larger number of patients.

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### Compliance with ethical standards

**Conflict of Interest:** The author declares no conflict of interest.

**Ethical Approval:** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional Iraqi health standards.

**Informed Consent:** Informed consent was obtained from all individual participants included in the study.

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