

# Brassica Breakthrough

Herbal Anti-acne Alternative Proves  
Clinically Effective

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Acne is one of the most common multifactorial chronic inflammatory diseases of the pilosebaceous follicle. It involves androgen-induced sebaceous hyperplasia, altered follicular keratinization, hormonal imbalance, immune hypersensitivity and bacterial (*Propionibacterium acnes*) colonization.<sup>1</sup> Clinical features include oily skin, non-inflammatory lesions, i.e., open and closed comedones, and inflammatory lesions (papules and pustules).<sup>2</sup> More severe acne may cause deep inflammatory nodules, cysts and even fistular tracts, in addition to significant permanent scarring.

Acne is most commonly present on the face but can also affect the neck, chest, back and

upper arms. Women are more affected than men and 75-95% of teenagers will experience acne. Acne may also begin during the adult years and approximately 12% of women and 3% of men will have acne until their mid-forties.<sup>3</sup>

Although acne lacks the urgency of a life-threatening condition, without impairing overall fitness, it produces long-term ramifications, which can be momentous, causing cutaneous and emotional scars that last a lifetime. It hampers an individual's confidence, causing physical, social and psychological suffering and reduces self-esteem with the increased emotional distress caused by perceived disfigurement.<sup>1</sup>

In terms of pathogenesis, four key components of acne development are influenced by androgens: 1) excessive sebum production and follicular plugging; 2) enlargement of the sebaceous glands and development of microcomedones; 3) inflammatory process triggered by *P. acnes* in microcomedones; and 4) further



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## New acne treatments must be developed to balance efficacy with excellent tolerability. This will ensure patient adherence and good clinical outcomes.

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inflammation from the released cytotoxic and chemotactic agents.<sup>3</sup>

In terms of severity grades, acne can be categorized from mild or moderate to severe. Mild acne typically comprises open and closed comedones (< 20) and inflammatory lesions (< 15) of less than 30 in total. Likewise, in moderate acne, numerous papules and pustules are observed along with comedones (20-100) and inflammatory lesions (15-50), with total lesions ranging from 30-125. Severe acne is diagnosed as extensive lesions including nodules and scarring together with cysts (> 5). In this worst case, the total comedone count is more than 100, total inflammatory lesions are higher than 50, and total number of lesions surpasses 125.<sup>1</sup>

Therapeutically, although there are numerous drug alternatives for the treatment of acne—e.g., topical systemic retinoids and antibiotics, and topical keratolytics—the foremost challenge is the growing concern over antibiotic resistance and dermal and systemic toxicities with existing medications.<sup>1,4</sup> The largest hurdle in the treatment of acne is patient non-compliance, which is due in large part to poor tolerability with common acne medications. As such, new acne treatments must be

developed to balance good anti-acne efficacy with excellent tolerability; this will ensure patient adherence and, by extension, positive clinical outcomes.<sup>5</sup>

Plant-based preparations can serve as therapeutic alternatives, potentially safer choices or in some cases, as the only effective treatment.<sup>6</sup> Therefore, an increasing tendency is to try natural alternative remedies.<sup>1,7</sup> Newly developing natural therapies include naturally derived drugs from active plant extracts, essential oils and phytochemicals.<sup>1</sup> Ingredients in topical acne treatments, particularly herbs and naturally derived compounds, have received considerable interest as they show fewer adverse effects than synthetic agents.<sup>8</sup>

Although some herbs have been explored for their anti-acne efficacy, many remain unexamined.<sup>9</sup> In relation, the present article describes an acne treatment incorporating two *Brassica oleracea* variants whose anti-inflammatory, antimicrobial and antioxidant effects were previously reported.<sup>10,11</sup> Described herein preliminary clinical trials aimed to determine the efficacy and tolerability of the topical herbal blend to treat mild to moderate acne.

### Materials and Methods

**Extract preparation:** Edible grade *B. oleracea* var. botrytis (cauliflower) and *B. oleracea* var. italica (broccoli) were obtained from a commercial farm in İzmir, Turkey. The plants were picked and processed within two days to obtain extracts. The plant parts were finely cut and two parts cauliflower to one part broccoli were boiled in water for three hours, then cooled to room temperature. The extract was filtered and concentrated using a rotary evaporator.

Benzyl alcohol was added as a preservative at 1% w/w. The sample was tested microbiologically after 24 hr and the microbiological limits

In the U.S. alone, acne affects 40 to 50 million people. Sales of the top 10 acne brands include \$600 million in topical antibiotics and \$240 million in topical retinoids.



Source: Global Cosmetic Industry  
([www.GCI magazine.com](http://www.GCI magazine.com))

for cauliflower-broccoli extract were identified as follows: total aerobic microbial count  $\leq 100$  CFU/g; total yeast and mold count  $\leq 100$  CFU/g; *Escherichia coli* = absent in a 1-g sample; and *Salmonella* species = absent in 25-g sample.

**Formula preparation:** The anti-acne cauliflower-broccoli extract was incorporated into an anti-acne spot gel at 20%, along with

niacinamide (2%) for its auxiliary antiseborrheic and anti-inflammatory benefits.<sup>8, 15, 16</sup>

The final product was formulated as shown in **Formula 1**.

**Clinical panel:** Otherwise healthy 20 male and female subjects having mild to moderate acne enrolled in the trial with informed consent and institutional ethical committee approval.

## ● Formula 1. Anti-acne Test Formula

	% w/w	Function in formula
Water ( <i>aqua</i> )	qs	solvent
Acrylates/C10-30 Alkyl Acrylate Crosspolymer	1.30	viscosity control
Anti-acne Herbal Extract Blend	20.00	herbal active
Niacinamide	2.00	antiseborrheic
Sodium Hydroxide (0.01 N solution)	1.00	pH adjustment
Phenoxyethanol (and) Benzoic Acid (and) Dehydroacetic Acid	1.00	preservative
Glycerin	3.00	humectant
PEG-40 Hydrogenated Castor Oil	1.00	solvent



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All subjects were 16 years or older and were not using any topical or systemic medications. They also had no hypersensitivity history and none of them were pregnant or in lactation period.

**Preliminary dermatological examinations:**

After assessing the skin type of each subject, based on sebumeter results and clinical history, the papules and pustules on the faces of subjects were counted by a dermatologist. The gender, age and skin type distribution of the subjects are depicted in **Table 1**.

**Application of spot gel:** All subjects applied the test preparation to their faces twice daily for four weeks. The subjects were directed to visit the responsible dermatologist if any sensitization or irritation ensued during the relevant period. Note that in this preliminary study, the objective was only to obtain safety and efficacy data, thus a placebo or control was not included in the test protocol.

**Clinical assessment:** After four weeks of application, clinical assessment was performed by the dermatologist, again in reference to the number of papules and pustules. In addition, subjects completed a self-assessment regarding the efficacy and tolerability of the test preparation. A student's *t*-test was used for statistical analysis.

## Results

No complaint of sensitivity or irritation was reported during the course of the trial, so treatment using the gel was uninterrupted throughout the course of the study. During the final dermatological exam at the end of the trial, no participants showed signs of developing any pathological skin disorders in the test areas. The preparation was therefore well-tolerated and did not cause unwanted skin reactions. The general impression was satisfactory.

The differences in the total numbers of papules and pustules are depicted in **Table 2** and **Table 3**, respectively; the overall differences of acne symptoms concerning the sum of papules and pustules are depicted in **Table 4**.

The herbal anti-acne spot gel significantly improved acne symptoms including papules (-22.91%;  $p < 0.0017$ ), pustules (-30.84%;  $p < 0.0042$ ) and the sum of papules and pustules (-14.69%;  $p < 0.0005$ ). The beginning and fourth week mean values are depicted in **Figure 1** on Page 68.

## Discussion

As noted, acne affects most of the population at some point and is not subject to a specific demographic group or sex. Adolescents continue to be the most widely affected by acne, however, almost 30% of all

● **Table 1.** Gender, Age and Skin Type Distribution of Test Subjects

Subject No.	Gender	Age*	Skin type
1	f	32	combination
2	f	24	oily
3	f	17	oily
4	f	21	combination
5	f	49	combination/sensitive
6	m	16	combination
7	f	22	combination
8	f	17	combination
9	f	37	combination
10	m	37	normal/sensitive
11	f	28	combination/sensitive
12	f	22	combination/sensitive
13	f	28	combination
14	f	31	combination
15	f	25	combination
16	f	32	combination/sensitive
17	m	19	combination
18	m	27	combination
19	m	32	combination
20	m	19	dry/sensitive

\* Mean age  $\pm$  standard deviation (SD) value = 26.75  $\pm$  8.35



A close-up photograph of a woman with blonde hair, smiling warmly. She is holding a large head of cauliflower in front of her chest with both hands. The background is plain white. In the top right corner, there is a small orange circle.

## Clinical outcomes of the cauliflower and broccoli extract blend were highly significant.

patients treated for acne are older than 24 years of age. In fact, 50% of women who experience acne do so during their adult years.<sup>12</sup>

An increased occurrence of psychological distress also is common in acneic patients, although it typically diminishes with adequate treatment. Indeed, it has repeatedly been shown that an improvement in acne can significantly improve self-esteem and positive emotion.<sup>13</sup> Although acne can change according to relevant etiological factors, its therapy is generally long and cumbersome.

Whatever the main etiologic factor is, i.e., psychological distress, constitutional factors, hormonal imbalance, drugs, etc., the pathogenetic end result is sebaceous gland

dysfunction, overproduction of normal flora and *P. acnes*, T-cell activation, and generation of reactive oxygen species and protease enzymes, which lead to the follicular wall rupture of sebaceous glands.

Consequently, this changes the composition of sebum, particularly levels of linoleic acid; hyperkeratinization is initiated; and desquamation is reduced. Subsequently, proinflammatory cytokines are released, causing microcomedones. The resulting microcomedones further develop into comedones and inflammatory lesions.<sup>1,8</sup>

Therefore, it is imperative to preserve patient compliance while presenting an effective treatment option. Herbal extracts are an

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*Continued on Page 66*



● Table 2. Total Papules, Differences and Change Ratios

Subject No.	Beginning	After 4 weeks	Difference	Change (%)
1	22	13	-9	-40.91
2	26	21	-5	-19.23
3	2	4	2	100
4	82	75	-7	-8.54
5	10	3	-7	-70
6	10	10	0	0
7	15	12	-3	-20
8	4	12	8	200
9	7	8	1	14.29
10	10	7	-3	-30
11	21	7	14	-66.67
12	8	5	-3	-37.5
13	10	8	-2	-20
14	10	8	-2	-20
15	22	9	-13	-59.09
16	22	14	-8	-36.36
17	45	27	-18	-40
18	54	50	-4	-7.41
19	30	25	-5	-16.67
20	43	32	-11	-25.58
Mean ± SD	22.70 ± 19.97	17.50 ± 17.76	(-5.20 ± 6.04)	(-22.91 ± 60.91)

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● Table 3. Total Pustules, Differences and Change Ratios

Subject No.	Beginning	After 4 weeks	Difference	Change (%)
1	6	1	-5	-83.33
2	13	6	-7	-53.85
3	3	7	4	133.33
4	16	12	-4	-25.00
5	7	2	-5	-71.43
6	4	12	8	200.00
7	2	2	0	0.00
8	2	4	2	100.00
9	13	1	-12	-92.31
10	1	0	-1	-100.00
11	8	3	-5	-62.50
12	2	3	1	50.00
13	7	1	-6	-85.71
14	12	8	-4	-33.33
15	4	0	-4	-100.00
16	7	1	-6	-85.71
17	20	15	-5	-25.00
18	6	3	-3	-50.00
19	60	54	-6	-10.00
20	23	12	-11	-47.83
Mean ± SD	10.80 ± 13.12	7.40 ± 11.91	-3.45 ± 4.74	-30.84 ± 82.65

attractive option, due to their wide range of anti-inflammatory, antimicrobial and antioxidant properties as well as minimal irritation potential.<sup>1, 4, 6, 8-11</sup>

As stated, in recent years, the anti-inflammatory, antimicrobial, antioxidative and antiproliferative effects of different *B. oleracea* variants were studied in vivo and in vitro.<sup>10, 11, 14</sup> The genus *Brassica* contains high amounts of glucosinolates, which are metabolized to isothiocyanates and later, sulforaphane. These nitrogen and sulfur containing products are proven to be the cause of health-promoting effects of these plants.<sup>11, 14</sup> Interestingly, in our search of the literature, we found many anti-acne clinical studies with other plant extracts,<sup>1, 7, 9</sup> but data was lacking for *B. oleracea*.

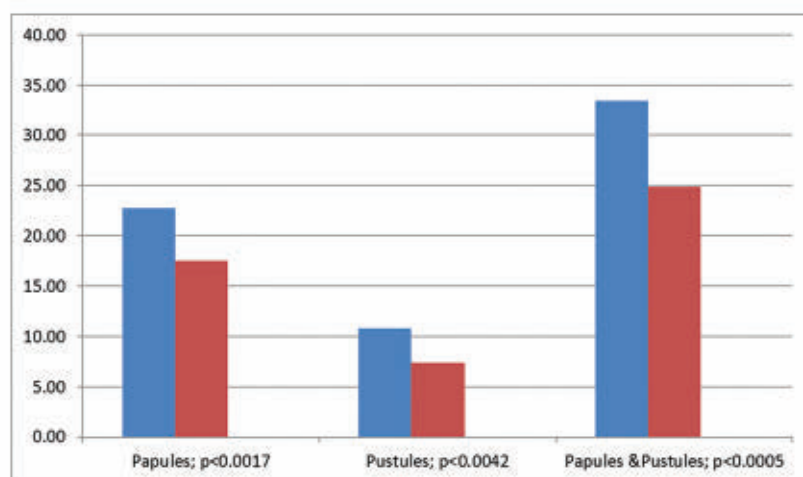
Due to the health-promoting properties of this species, especially anti-inflammatory and antimicrobial effects, and also considering the pathogenesis of acne described above, we hypothesized its potential anti-acne efficacy and designed the preliminary study described here. We selected the two variants of *B. oleracea*, i.e., var. botrytis/cauliflower and var. italica/broccoli, to obtain a synergistic effect. Furthermore, these plants have been and are consumed worldwide without any adverse effects reported.

At the end of the fourth week, the clinical outcomes were highly significant in terms of changes in the total numbers of papules, pustules and the sum of two. This data is very encouraging, as most clinical dermatologists would agree that four weeks is a short period to treat acne vulgaris. The results would most



● Table 4. Sum of Papules and Pustules, Differences and Change Ratios

Subject No.	Beginning	After 4 weeks	Difference	Change (%)
1	28	14	-14	-50
2	39	27	-12	-30.77
3	5	11	6	120
4	98	87	-11	-11.22
5	17	5	-12	-70.59
6	14	22	8	57.14
7	17	14	-3	-17.64
8	6	16	10	166.66
9	20	9	-11	-55
10	11	7	-4	-36.36
11	29	10	-19	-65.51
12	10	8	-2	-20
13	17	9	-8	-47.05
14	22	16	-6	-27.27
15	26	9	-17	-65.38
16	29	15	-14	-48.28
17	65	42	-23	-35.38
18	60	53	-7	-11.67
19	90	79	-11	-12.22
20	66	44	-22	-33.33
Mean ± SD	33.45 ± 27.53	24.85 ± 23.97	-8.6 ± 9.16	-14.69 ± 61.23



● Figure 1. Beginning and fourth-week mean total numbers of papules, pustules and their sums

likely be more striking if the treatment period were extended.

## Conclusions

Although more clinical investigations are needed, this preliminary data gives evidence that the described herbal anti-acne formulation is highly effective, causing no irritation in mild to moderate acne and most importantly, offers an alternative to classical anti-acne medications.



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