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THERAPEUTIC AND TRADITIONAL APPLICATIONS OF TRIGONELLA FOENUM-GRAECUM (FENUGREEK) AND NIGELLA SATIVA (BLACK SEED): AN INTEGRATIVE REVIEW

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ABSTRACT

Trigonella foenum-graecum (fenugreek) and Nigella sativa (black seed) are ancient herbs that have been prized for millennia in traditional medicine systems, including the Islamic Prophetic healing system. These plants are not only part of traditional ethnopharmacology but have also drawn increasing scientific attention because of their varied therapeutic potentials. This review integrates classic Islamic sources and modern biomedical findings to present an overview of the pharmacological properties of these plants. Fenugreek is traditionally known for its metabolic, lactogenic, and gastrointestinal benefits, which are ascribed to major phytochemicals such as diosgenin, trigonelline, and galactomannan. Likewise, black seed, which is considered a cure-all in Hadith literature, is known to possess strong anti-inflammatory, immunomodulatory, antidiabetic, and anticancer effects, which are largely ascribed to thymoquinone and other bioactive compounds. This article also discusses their combined use in treating metabolic and immune-related diseases. By taking ancient knowledge into conjunction with contemporary research, this book brings to light the promise of these plants in science-based integrative medicine and invites further clinical acceptance of their medicinal functions.

INTRODUCTION

Trigonella foenum-graecum (fenugreek) and *Nigella sativa* (black seed) have been greatly prized for millennia in both traditional and predictive medicines because of their abundant therapeutic values. Fenugreek, a self-fertilized leguminous herb, is well known for its multifarious pharmacological profile due to the presence of bioactive compounds such as alkaloids, flavonoids, steroids, and saponins. Historically, fenugreek has been used to reduce blood sugar and cholesterol levels, treat gastrointestinal diseases, and enhance overall health and vitality (Basch et al., 2003; Amin et al., 2005).

Nigella sativa, commonly known as black seed, black cumin, or Habbat al-Barakah, holds a unique place in Islamic culture and prophetic medicine. Respected for millennia, it is cited in the Prophet Muhammad's (PBUH) sayings as "a remedy for every disease except death" (Ali and Mahfouz, 2014). Contemporary scientific research has supported many of its traditional applications, exhibiting antioxidant, anti-inflammatory, antimicrobial, and immune-modulating actions

(Ahmad et al., 2013; Gholamnezhad et al., 2016). The seeds are rich in thymoquinone, a powerful phytochemical that is responsible for most of its medicinal benefits, along with essential fatty acids, vitamins, and minerals. This review aims to integrate traditional uses and modern pharmacological research to emphasize the enduring relevance of these plants in medical practice. By connecting traditional knowledge and scientific literature, we hope to emphasize the enduring relevance of black seed and fenugreek in the prevention and treatment of numerous illnesses.

Botanical and Nutritional Profile

The medicinal potential of *Trigonella foenum-graecum* (fenugreek) and *Nigella sativa* (black seed) lies in their dense botanical composition and varied phytochemical profiles. These two herbs have been widely utilized throughout Asia, the Middle East, and North Africa as both medicinal plants and functional foods, reflecting their nutritional and medicinal properties.

Fenugreek is an annual herbaceous plant in the Fabaceae family that is widely grown in Mediterranean areas, South Asia, and North Africa. It has small, angular, yellowish-brown seeds with a bitter flavor and a strong aromatic odor. Fenugreek seeds are a rich source of dietary fiber, vegetable protein, and micronutrients, such as iron, magnesium, calcium, zinc, selenium, and vitamins A, B1 (thiamine), B2 (riboflavin), B3 (niacin), and C (Basch et al., 2003). Among the bioactive compounds of plants, one of the most researched is 4-hydroxyisoleucine, a novel non-protein amino acid with established insulin-secretagogue activity. It triggers the release of insulin in a glucose-dependent manner, making it extremely important in the treatment of diabetes mellitus (Kaviarasan et al., 2006). Furthermore, fenugreek seeds contain galactomannan, a soluble fiber that decelerates gastric emptying and slows the rate of glucose absorption in the small intestine, thereby enhancing postprandial glycemic control (Basch et al., 2003; Rao et al., 2020) (Figure 1).

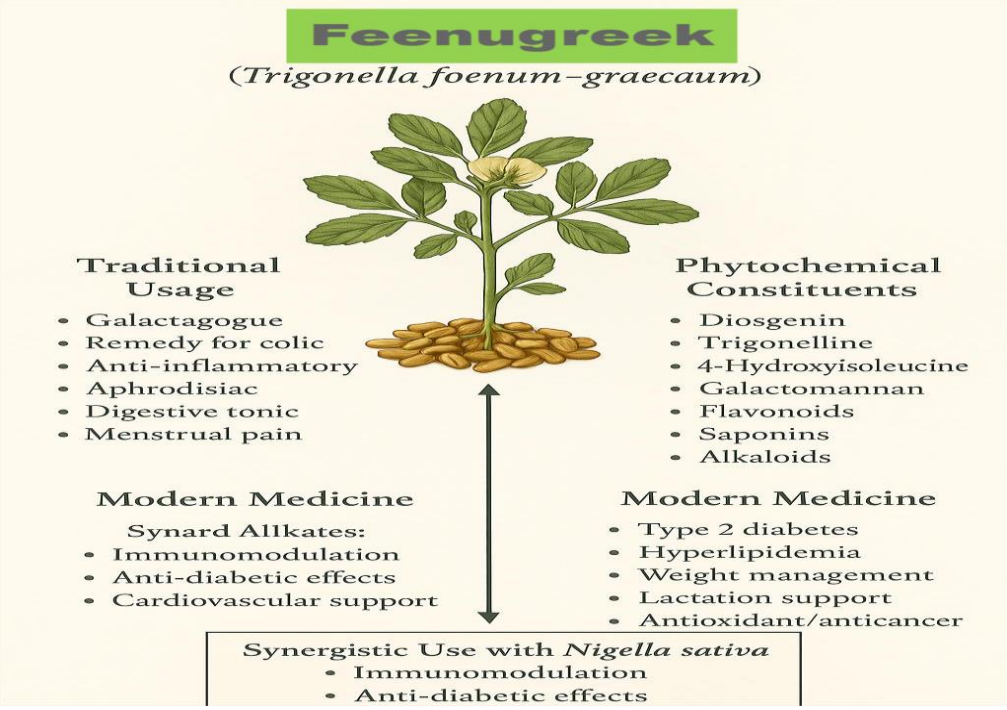

Figure 1: Fenugreek (Trigonella foenum-graecaum)

Other bioactive constituents in fenugreek include trigonelline, saponins, diosgenin, flavonoids, and mucilage, all of which have combined hypocholesterolemic, anti-inflammatory, and antimicrobial activities. The presence of saponins and steroidal compounds in the plant also aids its use in reproductive health and hormonal balance. This formulation not only justifies its historical

use for digestion, fever, and lactation but also underlies its increasing use in clinical nutritional therapy.

Nigella sativa, a plant in the *Ranunculaceae* family, is an herb with finely textured foliage and pale blue or white flowers. The plant bears small, angular black seeds, usually called black cumin or "Habbatul Barakah" (the blessed seed), which are widely used in traditional medicine and cookery throughout the Islamic world and the Indian subcontinent. More than 100 phytochemical constituents have been isolated from *Nigella sativa*, of which the most significant is thymoquinone, a lipophilic monoterpene possessing robust antioxidant, anti-inflammatory, and anticancer properties (Ahmad et al., 2013; Al-Mustafa & Al-Thunibat, 2008). In addition to thymoquinone, other significant components include nigellone, p-cymene, carvacrol, α-hederin, and thymohydroquinone, along with essential nutrients such as linoleic acid, oleic acid, palmitic acid, and amino acids arginine and glutamic acid.

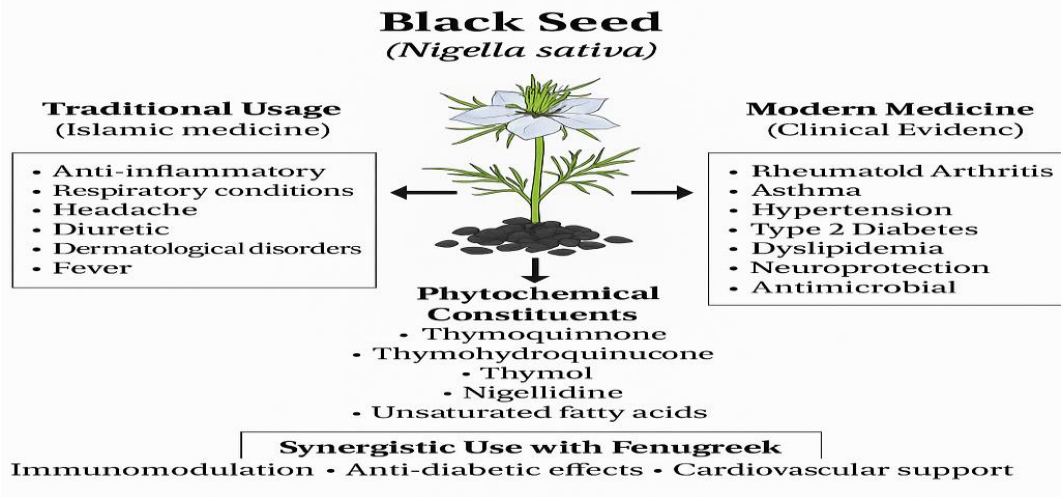

Figure 2: Black Seed (Nagella sativa)

The seeds are also rich in essential fatty acids, which play key roles in the integrity of cell membranes, cardiovascular function, and hormonal balance. Vitamins A, B1, B2, B3, and C, along with minerals such as calcium, iron, potassium, and phosphorus, contribute to its extensive therapeutic potential. The antioxidant activity of black seeds is mainly due to their free radical-scavenging activity and ability to increase the activity of endogenous antioxidant enzymes, such as superoxide dismutase and glutathione peroxidase (Gholamnezhad et al., 2016).

Combined, the phytochemical and nutrient density of these plants make them biologically active nutraceuticals that can modulate important physiological pathways. The multifaceted nature of their constituents facilitates interactions with several cellular targets, accounting for their efficacy across a range of systems, including metabolic, cardiovascular, endocrine, respiratory, immune, and gastrointestinal systems. Their dual function as food and medicine validates the prescient and ancient wisdom of employing simple natural agents in the pursuit of holistic well-being. A comparison of the major phytochemicals present in fenugreek and black seeds is presented in Table 1.

Table 1. Major Phytochemical Constituents of Fenugreek and Black Seed

Compound	Fenugreek (T. foenum-graecum)	Black Seed (N. sativa)
Amino acids	4-Hydroxyisoleucine, Tryptophan	Arginine, Glutamic acid
Alkaloids	Trigonelline, Gentianine	Nigellidine, Nigellicine
Saponins	Diosgenin	α-Hederin
Flavonoids/Polyphenols	Vitexin, Orientin	Quercetin, Kaempferol
Essential Oils	–	Thymoquinone, Thymohydroquinone, p-

		Cymene
Vitamins	A, B1, B2, B3, C	A, B1, B2, C, Niacin
Minerals	Iron, Calcium, Magnesium	Iron, Potassium, Calcium

Historical and Prophetic Use

The use of *Nigella sativa* (black seed) and *Trigonella foenum-graecum* (fenugreek) in Islamic and traditional medicine is deeply rooted in both spiritual beliefs and cultural practices. In Tibb al-Nabawi, or Prophetic Medicine, which is a health-related teaching derived from the doings and sayings of the Prophet Muhammad (peace be upon him), black seed enjoys a particularly sacred status. It is most famously quoted in a Hadith narrated by

Abu Huraira: "Use this black seed regularly, because it contains a cure for every disease except death" (Sahih Bukhari 5688). This phrase, which has been widely accepted among Islamic scholars and traditional healers, has made *Nigella sativa* an integral part of Islamic holistic health practices for more than a thousand years (Al-Akili, 1993).

Black seed has been used historically as a broad panacea and for specific therapeutic uses. In traditional Unani and Islamic medicine, it is used for respiratory diseases, digestive issues, fever, headaches, and skin problems. It is usually pulverized into powder, infused in oil, or combined with honey, vinegar, or warm water for oral or local use. Even the Prophet (PBUH) himself is said to have utilized black seed in nasal formulations and advised its use during sickness, particularly in situations with congestion and respiratory pain (Muhammad, 2014).

Even though fenugreek is not mentioned in the central Prophetic traditions (Hadith), it is well documented in Islamic and Greco-Arab medicine by leading classical scholars. Ibn Qayyim al-Jawziyyah, in his treatise "Al-Tibb al-Nabawi" (The Prophetic Medicine), refers to fenugreek (Arabic: hulbah) in the context of therapeutic practices familiar to the early Muslim people. He stressed its warming and softening nature and used it to treat symptoms such as persistent cough, constipation, and diseases of the reproductive organs. Likewise, Al-Razi (Rhazes) and Ibn Sina (Avicenna), prominent doctors of the Islamic Golden Age, observed the efficacy of fenugreek in gastrointestinal care, suppression of fever, and as a tonic for recuperation (Al-Snafi, 2017).

Ancient fenugreek uses involved a porridge-like food preparation for women after childbirth to support lactation and healing of tissues, and herbal teas to calm irritated mucous membranes in the gastrointestinal tract. Poultices made from fenugreek were also applied topically to reduce swelling and abscesses, a varied use mirroring its currently known pharmacological activity (Kooti et al., 2016).

Significantly, in Islamic ideology, these remedies were never considered to be superficial herbal substances but expressions of God's wisdom and mercy in offering natural remedies for human suffering. They were used with spiritual intentionality (niyyah), and the act of healing was considered both physical and metaphysical. This gave rise to a distinct medical tradition grounded in balance, moderation, and deference to natural law, principles that resonate increasingly in contemporary holistic and integrative medicine.

In summary, both *Nigella sativa* and *Trigonella foenum-graecum* have an ancient position in the traditional Islamic medical paradigm. The fact that they are still used today, sometimes alongside modern medications, is indicative of their lasting appeal as both spiritual and medicinal treatments. With the renewed interest in natural medicine, these plants serve as representatives of the ways in which religious tradition and scientific inquiry can come together to foster holistic human health.

Scientific Validations

Contemporary biomedical investigations have greatly expanded our knowledge of the therapeutic properties of Trigonella foenum-graecum (fenugreek) and Nigella sativa (black seed), giving empirical credit to centuries of prophetic and anecdotal medicine. These scientific validations have not only reconfirmed their classical functions but also created new avenues for their use in clinics.

Fenugreek has also been extensively explored for its effectiveness in controlling type 2 diabetes mellitus. Several clinical and animal studies have proven its hypoglycemic effect. Its major mechanism is thought to be its considerable amount of galactomannan fiber and 4-hydroxyisoleucine, which cause a delay in gastric emptying, regulate the absorption of glucose, and stimulate insulin release (Basch et al., 2003; Rao et al., 2020). In a 12-week clinical trial, fenugreek-

fortified bread (chapatis) considerably decreased HbA1c, fasting blood glucose, and waist circumference in patients with diabetes, validating its role as a functional food for metabolic control (Rao et al., 2020).

In addition to its antidiabetic effects, fenugreek has shown significant hypolipidemic effects. Studies have demonstrated that it considerably lowers serum triglycerides, LDL, and total cholesterol and raises HDL, thus enhancing cardiovascular risk profiles (Kaviarasan et al., 2006; Shari et al., 2020). These effects are largely explained by the saponin content, which interferes with bile salt reabsorption and enhances cholesterol expulsion (Kooti et al., 2016). Animal studies have also demonstrated that fenugreek extract inhibits ethanol-induced oxidative stress and apoptosis in hepatic cells, indicating its hepatoprotective action (Kaviarasan et al., 2006).

Nigella sativa and its active constituent, thymoquinone, have been the subject of intensive pharmacological assessments. Thymoquinone exhibits a wide range of biological activities, including antioxidant, anti-inflammatory, anticancer, and immunomodulatory effects (Ahmad et al., 2013; Gholamnezhad et al., 2016). Its antioxidant action is also associated with its potential to stimulate the activity of enzymes such as superoxide dismutase and catalase, inhibit lipid peroxidation, and suppress nitric oxide generation, thereby minimizing oxidative damage (El-Dakhakhny et al., 2000; Al-Mustafa & Al-Thunibat, 2008).

In addition, black seeds have been shown to exhibit significant effects on respiratory health. Clinical research has indicated that oral supplementation of *Nigella sativa* markedly improves asthma, attenuates airway inflammation, and enhances pulmonary function in patients with moderate asthma (Khan & Siddiqui, 2015). Its hepatoprotective effects have been confirmed in animal models, where black seed oil preserved against drug-induced liver damage and restored liver enzyme profiles (Al-Malki & Sayed, 2010).

One of the main hopeful areas of application for quillsome *Nigella sativa* is oncology, as preclinical research has shown that thymoquinone triggers apoptosis in several cancer cell lines by regulating genes involved in cell cycle arrest and apoptotic signaling, including p53, Bcl-2, and caspase-3 (Ahmad et al., 2013; Gholamnezhad et al., 2016). It also inhibits angiogenesis and metastasis through the inhibition of vascular endothelial growth factor (VEGF) and matrix metalloproteinases (MMPs).

In addition, increasingly available evidence favors black seed and fenugreek being used in synergistic combinations. A summary of evidence-supported therapeutic roles of both herbs across different health conditions is provided in Table 2. Research by Shari et al. (2020) indicated that a combined preparation of *Nigella sativa* and *Trigonella foenum-graecum* dramatically enhanced antioxidant enzyme activity and lipid profiles of diabetic patients and, by extension, may hold promise for complementary therapeutic regimens that leverage the distinctive phytochemistry of each herb.

These strong results from recent pharmacological research validate the historic applications of fenugreek and black seed in chronic disease prevention and treatment, such as diabetes, hyperlipidemia, liver disease, respiratory infection, and cancer. More significantly, they offer a rational, evidence-based basis for incorporating these herbs into mainstream medicine as adjunctive or main therapeutic agents.

Table 2. Evidence-Supported Therapeutic Applications

Health Condition	Fenugreek	Black Seed
Type 2 Diabetes	Enhances insulin secretion, lowers HbA1c	Improves insulin sensitivity, glycemic control
Hyperlipidemia	Reduces LDL, triglycerides, and total cholesterol	Lowers cholesterol and triglycerides
Respiratory Health	Anti-inflammatory, mucolytic	Relieves asthma and bronchitis symptoms
Digestive Health	Improves bowel movement, relieves constipation	Alleviates bloating, antimicrobial against gut pathogens
Immune Support	Antioxidant and anti-	Immunomodulatory, enhances

	inflammatory properties	natural killer cell activity
Cancer	Induces apoptosis in breast and colon cancer cells	Thymoquinone inhibits tumor growth, angiogenesis

Clinical and Prophetic Integration

In addition to their biochemical activity, *Trigonella foenum-graecum* and *Nigella sativa* hold deep spiritual and cultural importance, especially in the context of Islamic medicine, or Tibb al-Nabawi. The following prophetic maxim, "Use the black seed, for it contains a cure for every disease except death" (Sahih al-Bukhari 5688), has rooted *Nigella sativa* in the hearts and practices of Muslim populations for well over 1,400 years. Its application is not only therapeutic in nature but is also seen as a fulfillment of the instructions of the Prophet Muhammad (PBUH)—and so adding a component of spiritual obedience to its therapeutic value (Al-Akili, 1993; Muhammad, 2014).

The integration of prophetic medicines into contemporary healthcare systems facilitates a culturally-tailored, patient-focussed treatment option—especially among Muslim patients, where responses to religious prescriptions can be a determinant of compliance. Research into the use of Islamic medicine among chronically ill patients, e.g., cancer and diabetes, suggests that religiously sanctioned treatments like black seed are not only accepted but actively pursued as adjunct therapies (Traditional Islamic Medicine, 2014; Ali & Mahfouz, 2014).

Fenugreek, although less commonly mentioned in canonical Hadith, has been well documented in classical Islamic literature from scholars like Ibn Qayyim and Al-Razi. Its age-old application in post-delivery convalescence, gastrointestinal improvement, and treatment of fever strongly correlates with its contemporary pharmacological actions (Al-Snafi, 2017; Kooti et al., 2016).

Clinically, the integral philosophy reflected in prophetic medicine—focusing on natural equilibrium, dietary restraint, spiritual well-being, and ethical practice—are found to resonate with the modern trends of integrative and functional medicine. Therefore, fenugreek and black seed are not just natural medications, but also culturally confirmed therapeutic ingredients, which facilitate both physiological healing as well as spiritual comfort.

Their incorporation into contemporary treatment regimes, especially in Muslim cultures or among religion-minded patients, promotes therapeutic alliance and enhances compliance. In a sense, these herbs represent the fusion of science and scripture, reason and revelation—so that they are exemplars of the future of spiritually-informed, evidence-based medical practice.

Future Directions

With increased interest in evidence-based natural remedies, the future of *Nigella sativa* (black seed) and *Trigonella foenum-graecum* (fenugreek) is about their scientific optimization, technological advancement, and ethical incorporation within contemporary health care models. One of the most exciting frontiers is the exploration of nanoformulations and innovative delivery systems that can bypass challenges pertaining to bioavailability and pharmacokinetics. Natural products like thymoquinone are lipophilic by nature and destabilized under specific conditions; encapsulation in liposomes, nanoemulsions, or polymeric nanoparticles was found to enhance their solubility, protect them against degradation, and provide targeted release, thus improving therapeutic effects (Al-Mustafa & Al-Thunibat, 2008; Gholamnezhad et al., 2016).

Moreover, strict clinical trials are essential to establish standardized dosing regimens, define long-term safety profiles, and evaluate therapeutic efficacy in large, heterogeneous populations. Although several preclinical and small-scale clinical studies have validated the promise of these herbs, extensive, multi-center randomized controlled trials (RCTs) are needed to transfer this evidence into approved therapeutic guidelines. Investigating the synergistic effects of fenugreek and black seed with conventional pharmaceuticals—such as antidiabetic, anti-inflammatory, or chemotherapeutic agents—could further broaden their clinical utility and allow for reduced drug dosages and side effects in integrated treatment protocols.

A particularly novel and promising research frontier lies in the interaction of these botanicals with the gut microbiota. The human microbiome

is pivotal in immunomodulation, metabolic homeostasis, and even neurological well-being. Early indications are that phytochemicals in both black seed and fenugreek could have a beneficial impact on microbial diversity and function, with far-reaching systemic benefits in excess of their direct molecular targets. The morphology and medicinal parts of the plant are shown in Figure 2. Studying these effects through metagenomic and metabolomic means has the potential to reveal new paradigms in comprehension of their holistic impacts.

Lastly, ongoing research on these plants should be carried out with ethical precision and cultural sensitivity. The historical knowledge of fenugreek and black seed is rooted in ancient practices—Islamic medicine, in this case—and its contemporary application must pay respect to this heritage. Cooperative paradigms that integrate scientists, Islamic scholars, ethicists, and traditional practitioners can create a research climate that is both respecting of empirical methodology and faithfulness to tradition. These types of collaborations can help the growth of pharmacological knowledge to be inclusive, respectful, and fair.

Conclusion

Trigonella foenum-graecum (fenugreek) and Nigella sativa (black seed) are more than reminders of the ancient past—they are lasting models of how traditional healing knowledge, religious awareness, and scientific proof can peacefully coexist. Their pharmacologically varied profiles, tempered by centuries of empirical use and a growing body of scientific literature, attest to their relevance in the treatment of a broad array of conditions, ranging from diabetes and cardiovascular disease to immune derangement and chronic inflammation.

Fenugreek, with its insulin-stimulating amino acids and cholesterol-lowering saponins, and black seed, with its thymoquinone-mediating antioxidant and anti-inflammatory activities, are prototypes of nature's ability to provide multi-targeted therapeutic agents. Their dual role as both foods with nutritional value and highly effective medicines makes them prime candidates for inclusion within integrative and functional medicine paradigms.

The Prophet Muhammad's (PBUH) prescience in recognizing the healing property of black seed, and the respect given to fenugreek in historical Islamic medical writings, provide more than anecdotal insight they express a compelling vision of medicine that unites spiritual perception and bodily healing. Science has not merely validated the effectiveness of these treatments but goes on to add new layers to the foundations established by prophetic and traditional wisdom.

In celebrating their twin heritage of revelation and research, we step closer to a healthcare paradigm that honors the holiness of nature, the richness of tradition, and the accuracy of science. With these paradigms for an integrative healing, fenugreek and black seed continue to be guiding lights, pointing to a future when medicine cares for body and soul.

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