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REVIEW OF DIFFERENT PREPARATION PROCEDURES OF VANGA BHASMA, AN AYURVEDIC HERBO-METALLIC MEDICINE

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ABSTRACT

Bhasma is the conversion of inorganic metals, minerals and precious stones into bio-absorbable form. In *ayurveda Vanga* i.e. Tin comes under *Dhatuvarga* and is categorized as a *Putiloha*. *Vang bhasma* is described by different texts. Depending upon the materials used for pharmaceutical procedures named *Shodhan* (purification), *Jarana* (oxidation) and *Marana* (incineration) of *vanga*, therapeutic properties of *vanga bhasma* changed. *Bhasma* quality depends upon different parameters like quality of raw materials, processing ingredients and methods, meticulous trituration and heating cycle. *Bhasma* made with Mercury is believed to be *Shrestha* i.e. of superior quality, the one which are incinerated with herbs is believed to be *Madhyama* i.e. of medium quality, *Kanishtha* i.e. of inferior quality with sulphur, where the *bhasma* prepared with *Ariloha* are *Durgunaprada*. *Vanga bhasma* prepared from all these materials are found of different qualities. This article attains to review the correlation between different methods of preparation of *Vanga bhasma*, nature of the drugs used and its respective therapeutic potential.

INTRODUCTION

The invention of *Rasashastra* established specific and appropriate dosage form of metals and minerals known as *Bhasma*. These *Bhasma* showed high therapeutic efficacy in comparison with herbal medicines and required smaller doses, had quicker action, demonstrated high therapeutic efficacy, prolonged shelf life, tasteless and don't have any specific odour. *Vanga*

is one of the *Putilohas* which have *Ruksha guna, Tikt rasa* and *Ushna veerya*. *Vanga bhasma* is indicated in various diseases such as *mutrakrichha, pandu, prameha, krimi, shweta padara, rakta pradara, vrana, agnimandya, aruchi*, *swapnadosha*.[1] Reaserchers have proven its action on genito-urinary disorder such as capacity of testicular cell regeneration, its action in *madhumeha*, anaemia, asthama and gastric ulcer.[2] Properly prepared *bhasma* is nontoxic, easily absorbable, adaptable and digestible in the body. The ancient application of nanomedicine in the form of *ayurvedic bhasma* throws a light on the safer usage of present nanomedicine for living being and environment. In this study the therapeutic efficacy of *Vanga bhasma* is reviewed and this will lead to further evaluation of *bhasma*.

VANGA - BRIEF HISTORY

The term '*Vanga*' is indicative form of 'Bengal'. In ancient days, this metal was imported to India from South East Asian countries through the ports of Bengal by sea route. Since the metal was supplied in India from Bengal, it was named 'Banga', which eventually became '*Vanga*'. *Vanga* has a long history. Its references can be readily traced from literatures like *Veda, Upanishada* and *Purana* and its use for medicinal purposes was seen from '*Samhita kaal*'.[3] At many places of *Charaka samhita* and consecutive grantha, we find the references of *vanga*. With the evolution of *Rasashastra*, the metal was extensively studied for its toxic effects, described and used as medicine.

TIN – OCCURENCE

Tin is the most abundant element in the earth's crust. Tin does not occur as the native element but must be extracted from various ores. Deposits of tin are reported to be in Southern Mongolia, Colombia, South America, Australia, South Africa, China, Siberia and Malaysia. In India, it is found abundantly in Bihar.[4]

TIN ORES

Cassiterite (SnO_2) is the only commercially important ore of tin, although small quantities of tin are recovered from complex sulphides such as Stannite, Cylinride, Franckeite, Canfieldite and Teallite.[4] Minerals with tin are almost always associated with granite rock, usually at a level of 1% tin oxide content.

VANGA AT A GLANCE

Characters	Details
Varga	Dhatu (Putiloha)
Synonyms[5]	*Vanga, Ranga, Rangak, Kutil, Kurupya, Trapu, Trapush, Shukraloha*
Latin name	Stannum (Tin)
Symbol	Sn
Colour[6]	I. *Khurak vanga – Dhaval* (White) II. *Mishrak vanga – Shyam shubhra*
Grahya swaroop[6]	*Khurak vanga* having qualities like *dhaval, mridu, snigdha, drutadrava, gourav, nishabda, nirmala*
Agrahya swaroop[7]	*Mishraka vanga* having qualities like *shyama shubhrak, dhusara, kathin, ruksha, draveatikathin, anya dhatu mishrita*
Hardness	6.3
Specific gravity	7.3
Melting point	232^0c
Boiling point	270^0c
Guna[8]	*Rasa- amla, tikt, katu, kashaya; Guna- laghu, ruksha, sara, ushna,tikshna; Veerya- ushna; Doshaprabhava- kaphapittahara, ishat vataprakopaka; Karma-Deepan, pachana, balya, medohara, vrishya etc.*
Rogaghnata[9]	*Kasa, shwasa,medodosha, kapharoga, prasveda, prameha, kshaya, krimi, pandu, sweta pradara, rakta pradara, mutrakriccha, aruchi, agnimandya, vrana, ojomeha, ratrisweda, swapnadosha* etc.
Dose[9]	1-2 *ratti* (125-250 mg)
Anupan[9]	*Guduchi swaras* or satva, honey, ghee, *haridra ras*
Ashuddha / Apakva sevanajanya vikara[10]	*Kushtha, kilas, gulma, prameha, kshaya,pandu, shotha, kaphajwar, bhagandar, shukrashmari, raktavikar, hrudrog, shool, arsh, kasa, shwasa, vaman*
Ashuddha / Apakva sevanajanya vikara shanti upay[11]	'*Meshashringi choorna* + *sharkar*a' for 3 consecutive days.

SHODHANA

All the pharmaceutical procedures such as washing (*kshalana*), trituration (*mardana/ bhavana*), heating, dipping (*nirvapana*) etc. are carried out over a medicinal drug with the intention of getting it purified is called as *Shodhana.*[12] The process of *shodhana* includes both physical and chemical purification. Traditionally, the *ayurvedic* drugs are purified through *shodhana* which is important to reduce drug toxicities through different physical and chemical processes. *Vanga dhatu shodhana* is of two types i.e.*samanya shodhan* and *vishesh shodhan*.

In *samanya shodhana* the raw *vanga* is heated till it melts and then quenched sequentially in sesame oil, buttermilk, cow's urine, *kanji*, *kullatha kwatha* 7 times in each.[13] Different methods are explained in different *Granthas* for the *vishesh shodhana* of *Vanga*. These

methods of purification are useful to detoxify the raw material and it also modifies the properties of the therapeutic material to enhance their potential.

Drugs used in Vishesh shodhana of vanga[14.15,16,17,18,19,20,21,22,23,24,25,26,27,28,29]

Name of the drugs	Name of the shodhana procedure	Reference
Churnodaka	*Dhalana* - 7 times *Swedana* – 1.5 hr	*R.T.* 18/8-9 *R.CH. PU.*/605
Arkadugdha	*Nirvapana* – 7 times *Dhalana* - 3 times *Nirvapana* – 7 times *Nirvapana* – 3 times	*R.T.* 18/10 *R.Mr* 5/38 *R.CHI.* 6/6 *R.S.S.* 1/280
Haridrayukta nirgundi swaras	*Dhalana* – 3times	*R.T.* 18/11-12; *R.CH.PU.*/603; *R.CHU.* 14/265;*R.A. loha vijyaniyam* 87; *A.K.* 6/6; *B.B.R.* 4/6909; AFI 18:15
Mahishamutra + mahishasthi choorna	*Sinchana*	*Rasarnava*????/ 112
Amla takra + punarnava and vishatinduka choorna	*Dhalana*	*R.CH.PU*/604
Amlatakra and kumara swarasa	*Dhalana* – 3 times in each	*R.T.* 18/13-14
Nirgundi patra swaras + malachoorna	*Nirvapana* – 7 times	*R.R.S.*5/157
Amlatakra/ Kataphalakwath + punarnava and kupilu choorna	*Nirvapana* – 7 times	*R.R.S.* 5/156
Nirgundi swaras	*Nirvapana* – 7 times	*R.R. Rasakhanda* 62
Chincha kwath +kanji +nimbu swaras+ gomutra+sarjikshara+arka dugdha+snuhi dugdha+ haridra choorna etc kwath	*Nirvapana* – 7 times	*R.S. Dhatushodhanamarana prakarana*
Bhallataka tail	*Nirvapana* – 3 times	*R.P.S.* 4/82
Gotakra + punarnavamul choorna+ saindhava lavan choorna + vatsanabh visha choorna	*Nirvapana* – 3 times	*R.P.S.* 4/82
Gomutra+punarnava+vatsanabh vish+sindhuvarapatra	*Nirvapana* – 3 times	*R.CHU.* 14/136
	Swedana – ½ *yam*	*R.CH.PU.* 605
Arkadugdha	*Nirvapana* – 3 times	*R.S.S.* 1/280

Vanga Jarana

Vanga Jarana is the initial part of the *Marana* procedure, carried out to reduce particles of *Vanga* to a finer state of subdivision. This process is mainly for the metals having low melting point. *Jarana* of *vanga* is performed by '*Avapa*' procedure. In this procedure *Shuddha Vanga* is taken in vessel and this vessel is placed over intense fire. When the *vanga* melts completely other substances like *Apamarga, Ashwattha twaka, Kukutanda twaka choorna* are added in it and is known as *Avapa*.

Drugs used in Jarana of Vanga[20,23,29]

Name of Drugs	References
1. *Shuddha vanga+ chincha twaka choorna + ashwattha twaka raja choorna*	*A.P.* 3/177-178, AFI Part 1
2. *Shuddha Vanga + apamarga choorna + kukkutanda kapala raja / muktashukti raja / palasha pushpa choorna / vasa twaka choorna / ashwattha twaka choorna*	*R.A.*3/88-94, AFI Part 1

Vanga marana

The process of subjecting the metallic and mineral drugs for different pharmaceutical procedures using wide range of herbal formulation (*swaras, kwatha* etc.) and later subjecting them to intense heat to obtain them in the form of *bhasma* is called as *Marana* (incineration).[30] The literal meaning of the term ' *marana'* is 'to kill'. The process of killing of any metallic drug to make it fit for internal administration is called as *Marana*. This method is useful for conversion of metallic drug from a heavy, hard and rough structure to light, soft, and smooth powder. Also by this method the macro sized particles are reduced to their nano form.

Drugs used in Marana of Vanga[14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,31]

Bhasma prakar	Name of the drugs used	Put required/ Agni type	*Bhasma varna*	Reference
Parada marit	1) *Shu. Parada, shu.vanga, shu. Haratala*	*Tivragni* by Roasting in a frying pan (Kadhai)	*Shweta*	*R.T.* 18/15-18; *RRS* 5/159; *BBR* 5/6903; *R.CH.PU.*613; *R.CHU.*14/139
	2) *Shu. Parada, shu. Vangapatra, chincha beej, shirish beej, haridra choorna, kumara*	*Gajaputa*	-	*R.R.*8/96-98
	3) *Shu Parada, shu. Gandhaka, shu. Haratala, shu. Manashila, shu.shankhiya, shu. Hingula, nimbu swarasa*	*Tivragni*	-	*R.S. Dhatu shodhana marana* 3
	4) *Shu. Vangapatra, shu. Parada, haridra, shirish twaka, kumara swaras*	Laghuputa	*Shweta*	*A.K.* 6/11-12
	5) *Shu. Vanga, shu. Parada, shu.*	*Valukayantra paka*	-	*R.S. Dhatu shodhana marana* 3

	Gandhaka, shu. Haratala, nimbu swaras			
	6) Shu. Parada, shu. Vanga, shu. Haratala, arkadugdha, ashwathha twakakshara	*Lavakaputa*	-	*R.T.*18/25-28
	7) Shu. Parada, shu.vanga, shu. Haratala, nimbu swaras	*Puta in Damaruyantra*	-	*R.S. Dhatu shodhana marana* 2
Vanaspati marit	*1) Shu. Vanga, Apamarga choorna*	Tivragni by Roasting in a frying pan (kadhai)	*Shweta*	*R.T.* 18/19-24; *R. Mjr*.5/44-47; *R.CH.PU* 606-608; *A.P*.3/155-159; *R.S.S*.1/289-290; *BBR* 5/6898
	2) Shu. Vangapatra, Bhallataka for lepa	*Gajaputa*	-	*R.R*.8/99
	3) Shu. Vanga, Ashwathavalkala choorna	*Tivragni* by Roasting in a frying pan	-	*R.T.* 18/29-33
	4) Shu. Vangapatra, Bhallataka tail	*Chincha-palash-pippali kashtagni*	-	*R.R.S.* 5/161;*R.CH.PU*.614
	5) Shu. Vangapatra, Bhallataka tail, chinchavruksha twaka	*Gajaputa*	*Shweta*	*R.P. Lohaprakarana* 62
	6) Shu. Vangapatra, pinyak and atasi choorna	*Gajaputa*	-	*A.P*.5/161; *R.P. Lohaprakarana* 63
	7) Shu. Vangapatra, bibhitaka phal and bhallataka phala kwath, tilpinyaka kalk	*Gajaputa*	-	*A.K*.6/12-13
	8) Shu. Vanga, haridra –yavani-jirak-chinch-ashwatth choorna	*Roasting in a frying pan (Sharava)*	-	*R.CH.PU*.610-612; *BBR* 5/6899; *R.S.S.* 1/292-294
	9) Jarit vanga, kumari/shatavari swaras/ godugdha	*Ardhagajaputa*		AFI 18:15; *R.A. Loha vijnaniyam*
	10) Shu. Vangapatra, chincha-Ashwathhatvakaraja	*Gajaputa*	-	*BBR*4/6896
	11) Shu. Vanga, haridra choorna, soraka	*Tivragni* by Roasting in a frying	*Shweta*	*BBR* 4/6905

		pan *(Kadhai)*		
	12) Shu. Vangapatra, rasasindura, ajashakruta choorna, triphala choorna, haridra choorna, nimbu swaras	*Valukayantra paka*	-	*R.P.S.*4/85
	13) Shu. Vanga, chinchatwaka choorna / yavani choorna/ pippal twaka choorna	*Tivragni* by Roasting in a frying pan *(Kadhai*	-	*BBR* 5/6901;*BBR* 5/6904;*R.S.Dhatu shodhan marana* 2
	14) Shu. Vangapatra, palashadrava	-	-	*BBR* 5/6902
	15) Jarit Vanga, chincha choorna, kumari swaras	*Upalagni*	-	*R.P.S.*4/83-85
	16) Shu. Vanga, shu. Shilajit, haridra-yavani-apamarga choorna	-	-	*A.P.* 3/160; *R.P.Lohaprakarana* 62
Gandhaka marita	-	-	-	-
Haratala marita	1) *Shu. Vanga, shu. Haratala, arkadugdha, ashwathhatwaka and chinchatwakakshara*	*Laghuputa*	*Kapotavarna*	*R.R.S.* 5/158; *R.CHU.*14/137
	2) *Shu. Vangapatra, shu. Haratala, palashatwaka swarasa*	*Laghuputa*	-	*R.R.S.* 5/161; *R.R.* 8/92-95; *A.K.* 6/10-11
	3) *Shu. Vanga, shu. Haratala, arkadugdha*	*Tivragni paka*	-	*R.S. Dhatu shodhana marana* 3; *A.K.* 6/8
	4) *Shu. Vanga, shu.haratala, arkadugdha, shushka ashwathha valkala*	*Kukkutaputa*	-	*R.Mr.* 5/48; *R.CH.PU.*609; *R.S.S.* 1/288
	5) *Shu. Jarit vanga, shu. Haratala, nimbu swaras*	*Ardhagajaputa*	-	AFI 18:15; *R.S. Dhatu shodhan marana* 1
	6) *Shu. Vanga choorna, shu. Haratala, kumari swaras*	*Kukkutaputa*	*Shweta*	*R.P.Lohaprakarana* 61

	7) *Shu. Vanga, shu. Haratala,chinch and ashwathha twaka choorna, nimbu swaras*	*Gajaputa*	-	*B.B.R.* 5/6896; *A.K.* 6/8-9

Vanga bhasma properties[14,15,16,18,20,22,25,28,29]

Name of the classics	*Lavan*	*Katu*	*Tikt*	*Kashaya*	*Laghu*	*Ushna*	*Sheeta*	*Ruksha*	*Sara*
R.T.	+	+	+	+	+	+	+	+	+
R.R.S.	-	-	+	-	+	+	-	+	-
A.P	-	-	-	-	-	-	-	+	+
R.P.S.	-	-	+	-	-	-	-	+	+
R.CH.	-	-	+	-	-	+	-	+	-
R.S.S.	-	-	+	-	-	+	-	+	-
R.M.	-	-	-	-	-	-	-	-	-
R.Mr.	-	-	+	-	-	+	-	+	-
B.B.R.	-	-	+	-	-	-	-	+	-

Therapeutic efficacy of Vanga bhasma[14,15,16,18,22,23,24,25,28,29]

Diseases	*R.T.*	*R.R.S.*	*A.P.*	*R.P.S.*	*R.CH.*	*R.S.S.*	*R.M.*	*R.Mr.*	*B.B.R.*	AFI
Agnimandya	+	-	+		-	-	+	-	+	+
Adhmana	+	-	+		-	-	-	-	+	-
Kasa	+	-	+		-	-	-	-	+	+
Kshaya	+	-	+		-	-	-	-	+	+
Shwasa	+	-	+		-	-	-	-	+	+
Pandu	+	+	+		-	-	-	-	-	+
Shotha	+		+		-	-	-	-	-	-
Prameha	+	+	+		+	+	+	+	+	+
Kushtha	+	-	+		-	-	-	-	-	-
Raktapitta	+	-	+		-	-	-	-	-	-
Vrana	+	-	+		-	-	+	-	-	+
Kapharoga	+	+	+		+	-	-	+	-	+
Manovikara	+	-	+		-	-	-	-	-	-
Medovikara	+	+	+		-	+	+	-	+	+
Netrovikara	+	-	+		-	-	-	-	-	-
Shwetapradara	+	+	+		-	-	+	-	-	+
Shukrakshaya	+	+	+		-	-	+	-	-	-
Swapnameha	+	-	+		-	-	-	-	+	+
Krimi	+	+	+		+	+	-	+	-	+

DISSCUSION

There are different procedures for the preparation of *Vanga bhasma* and for this preparations different *shodhana dravyas* and *bhavana dravyas* are used. While doing *shodhana* and *bhavana* by *vishishta dravya*, the *guna* of these *dravyas* get involved in the *bhasma* and acts accordingly on *Roga* by increasing its potential. *Bhasma* prepared with *Parada* as a media is

Shreshta, as it helps in the disintegration of metals and minerals and *Parada* will enhance the property of the main metal from its *Yogavahi* property.[33] From classical texts like *Ayurveda prakasha* and *Rasa Ratna Samucchaya* it is clear that *Ariloha* means *Shatru loha* i.e enemy metal or opposite metal. *Ariloha* helps in faster disintegration of metals and minerals by forming sulphides or oxides and thus *Bhasma* can be easily prepared with less number of *putas*. But the qualities like *ushna*, *teekshna* and *visha* properties of *Arilohas* will be added into *Bhasmas*. As the prepared *Bhasma* becomes toxic and may leads to many disorders thus, *Bhasma* prepared with *Ariloha* is considered as *durgunaprada*.[33] *Bhasma* prepared with *Kashtoushadhies* as a media is *Madhyama*. Here alkaline and acidic contents of *Kashtoushadhies* helps in disintegration of atoms but *Marana* with this media needs more number of *Putas* and the *Kshara* property of the product will be increased.[33] This sometimes helps in curing diseases but sometimes it causes *dhatukarshaka* and *pumsatvanashaka*. There is no proper reference for the *Vanga bhasma* prepared by *Gandhaka* and the *Bhasma* prepared by it is said to be *Kanishta*. *Jarana* is the process which is responsible for the solidification of Metal and facilitates the process of incineration. By doing so, the further procedure of *vanga marana* will be lot more easier. *Vanga bhasma* prepared with *Parada* is acidic in nature, prepared with *Kashtoushadhies* is slightly alkaline and prepared with *Haratala* is alkaline in nature.[33] Particle size analysis is an objective parameter for the assessment of *Rekhapurnatva* property of *Bhasma* which is mentioned in *Rasashastra* classics. Smaller the particle size, larger is the surface area and greater are the chances of the absorption. *Bhasma* prepared by *Parada* is having lesser particle size when compared to other two medias which indicate greater chances of absorption.[33] Vanga *bhasma* prepared by *Hartala* is having lesser particle size when compared to *Kashtoushadh*.[33]

In this way, when *Apamarga kshara* which has *deepan, pachana, vatanulomana* property, *tikta- katu rasa, ushna veerya* is used for the preparation of *vangabhasma* causes *vidravana* of *kaph* in *Amashaya* which leads to proper breakdown and metabolism of food hence, used in *Ajirna*. In case of *Amlapitta* the *vanga bhasma* prepared by this *kshara dravya* convert its *amlata* into *madhurata* further causing *shoolashanti*. *Urastha kaphavilayana* and *vatanulomana* is caused by *apamarga* and therefore used in *Kasa, Shwasa, Hrudroga, Hrutshula*. With its *ushna veerya* and *katu rasa, kapha* and *kleda* gets liquefied hence, leading to *Mutravirechaniya karya*. It causes *Purishabhedana* by its *katu rasa, Dravapurisha nissarana* by its *ushna veerya* and *Medodhatu lekhana* by its *katu, ushna, tikshna guna*.[34] Due to all the above reasons *vangabhasma* prepared by using *apamarga kshara* shows more

précised action on these diseases. *Vangabhasma* prepared by use of *Arka* is has *deepan, pachana, krumighna* property and shows *Kasa, Shwasa, Jwarahara karya* as *arka* has all these properties.[35] *Vanga bhasma* prepared with the use of *Kumari, Yavani, Jeerak, Haridra, Bhallataka* is *tikta-katu* in *rasa, ushna veerya* and has *deepan, pachana, vatanulomana karya* hence effective in *Agnimandya, Anaha, Adhmana*.[36,37,38,39,40] *Vanga bhasma* when prepared with *Guduchi* and *Shatavari* causes *dhatvagnideepan* by its *tikta rasa* and *Madura rasa* which further leads to proper *parinaman of Ahararasa* into *rasadi dhatu* and thus has *Rasayana* effect whereas with *Bhallataka* it causes *Dushtadoshapachana* and *chedana* further leads to *dhatuposhana* and *rasayana* effect.[40,41,42] *Vanga bhasma* prepared with the use of *Kumari, Haridra* by its *katu-tikta rasa* causes *Raktadhatushodhana, raktashrita dushtakapha shodhana, raktashamana, raktaprasadana* which causes proper *karya* of *Ranjaka pitta* and hence used in *Pandu* and *Kamala vyadhi*.[36,39] *Vanga bhasma* when prepared with *Yavani, Nimb, Palasha, Bhallataka* which is *katu-tikta* in *rasa* and has *kledaghna* and *krumighna karma* while Nimba with its *sheet veerya* causes *stambhana karya* hence used in *Shwetapradara, Raktapradara* and *Chardi*.[37,40,43,44] Likely, *Nimb, Bhallataka, Haridra* when used for preparation of *vanga bhasma* it causes *shodhana* of *dushtastrava* and *puya* by its *tikta rasa* and *kledaghna* property hence, used in *Kushtha*.[39,40,43] *Vanga bhasma* when prepared with *Haridra* and *Guduchi* by its *tikt-katu rasa, katu vipaka* and *ushna veerya* causes *kapha-medodhatu shoshana* and *lekhana*, *shoshana* of *drava* in *kapha* and *kleda* leading to reduced *swedana* and *mutrapravrutti*[39,40] whereas *Bhallataka* and *Palasha* by its *katu-kashaya rasa, tikshna-ushna guna* causes *kledashoshana* hence, used in *Prameha*.[40,44] *Vangabhasma* prepared with *Shatavari* causes *Vajikarana karya, rakta-mansa dhatuposhana, majjagnideepan, ojovardhana* and hence used in *Manovikruti* which is mainly caused by *ojokshaya* diseases like *Unmada, Apasmara* can be treated by this type of *bhasma*.[42]

CONCLUSION

On the basis of observation available in ancient literature, one can conclude that the *Vanga bhasma* prepared by a particular method is may be more useful in specific type of disease.

Scope for the study

Vanga bhasma can be evaluated for these activities by using different preclinical and clinical model. Toxicity studies can also be done on these different types of *vanga bhasma.*

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