

HISTORICAL NOTES

ŚUKRANĪTI ON GUNS, CANNON AND GUNPOWDER

The *Śukranīti*¹ is a traditional Sanskrit text attributed to Śukrācārya, the sun of Bhr̥gu. The author's identity and his place are not known. *Śukranīti* is referred to in the *Mahābhārata* having 1000 chapters, though the present text is available only in 2200 verses or 2454 verses taking into account the verses available in other works. It appears that the traditional text whatever remains had been preserved or updated in the present form as late as 16th century AD.

The work has 5 chapters. The first three chapters describe the essence of morals required for the Princes and Kings and in the process underlines as to how to protect the rich natural resources in arts, science including environments and how to win wars against enemies. It (ch. 4. sec. 3) says that there were 32 main *vidyās* (science) and 64 major *kalās* (arts) practised though their numbers were infinite (*ananta*). The types have all been enumerated in this section. The 64 *kalās*² give a picture of the industrial, economic and political situations of the time. Among these *kalās* the metallurgy, analysis and synthesis of metals, polishing of metallic vessels, alloys, salts, work in iron foundaries were also considered as important among the traditional and contemporary *kalās*. Ch. 4 sec. 7 is on the types of arms, armies and their duties. In this context it has several verses on : short *nālika* instrument (gun), large *nālika* instrument (cannon), gun powder, shots (*topa*) etc.

These are described as follows :

Guns :

*tiryag-ūrdha cchidra-mūlam nālam pañca vitastikam /
mūla-agrayorlakṣyabhedi tīla bindu yutam sadā //
yantrā ghātāgnikṛd grāvacūrṇadhṛkkaṛṇa mūlakam /
sukāṣṭhopāṅgabudhnam ca madhyāṅgulabilāntaram//
svānte'gnicūrṇasaṅghātrśalākā samyutam dr̥ḍham/
laghunālikamapyetat pradhāryam pattisādibhiḥ //*

(ch.4,sec.7 vs.195-197).

“The small *nālika-astra* (gun)³ has an oblique (*tiryag*) upward hole throughout the barrel starting from the original (chamber) having length of five *vitastis* (2-1/2 cubits). It has sharp pointers (*tīla*) both at the forefront (of the barrel) and at the origin which are used as markers for fixing the objective. The fire is produced by the impact of the machine inside the original chamber which is full of gunpowder. The barrel, which is attached to the chamber is made of quality wood and the inside hole is equal to the size of the middle finger. With these is attached a strong rod for filling it tightly with gunpowder. It is known as short *nālika* instrument.”

Cannon :

*yathā yathā tu tvaksāraṃ yathā sthūla bilāntaram/
yathā dīrghaṃ br̥hadgolam dūrabhedi tathā tathā//
mūla kila bhramāllakṣyasamasandhānabhāji yat/
br̥hannālikāsarjñam tat kāsṭhabudhnavinirmitam//
pravāhyam śakāṭādyaiṣṭhu suyuktaṃ vijayapradam/*

(ch.4, sec.7vs.198- 199 ½)

“The large *nālika* instrument (cannon) has a barrel and hole, both much wider, length much bigger, from which larger shots (*br̥hadgolam*) could be thrown. The nails fixed at the original chamber are adjusted to fix the aim in proper direction. Its front portion is also made up of wood. It is drawn on a carriage. It is known as *br̥had nālika* (cannon). If well used it can lead to victory.”

Gunpowder preparation :

- 1) *suvarcī-lavaṇāt pañca palāni gandhakāt palam //*
antardhūma vipakkārkasnuhi-ādya-aṅgārataḥ palam /
śuddhāt saṅgrāhya samcūrṇya sammilya praputed rasaiḥ //
snuhi-arkānām rasonasya śoṣ ayed-ātapena ca /
pisthvā śarkarāvāt ca etadagnicūrṇam bhavet bhalu //
 (ch.4, sec.7 vs.199 ½ - 202)

“*Suvarcī* salt - five *palas*, sulphur - one *pala*, and charcoal from the wood of *arka snuhi* and other trees burnt in a manner that prevents the escape of smoke (in a closed vessel) –one *pala*, have to be purified, powdered and mixed together, then soaked in the juices of *snuhi*, *arka* and garlic, then dried by heat (of the sun). The materials finally are made to powder and look like sugar crystals. The substance is gunpowder.”

- 2) *suvaracī- lavaṇād bhāgāḥ ṣaḍ va catvāra eva vā/*
nālāstrārthagñicūrṇe tu gandhā aṅgārau tu purvavat//(ch.4, sec.7
 vs.203)

“Six or four *palas* of *suvarcī salt*, sulphur and charcoal remaining the same, may also be used in the preparation of gunpowder.”

- 3) *aṅgārasyeva gandhasya suvarcī-lavaṇasya ca /*
śilāyā haritālasya tathā sisamalasya ca //
hīngulasya tathā kāntarajasah karpūrasya ca /
jatornilyās'ca sarala niryāsasya tathaiva ca //
samanyunādhi kairamsairagni cūrṇanya nekaśah/
kalpayanti ca tadvidyās'candrikā bhādimanti ca //
 (ch.4, sec.7 vs.205 ½ - 208)

“Charcoal, sulphur, *suvarcī salt*, mixed with *haritāla*, lead (*sisā*), *hīngula*, *kāntisāra lauha* (iron filings), camphor (*karpur*) *jatu*, indigo extract (*nīli*) juice of *sarala* trees, less or more, are powdered to prepare various types of gunpowder. This when burnt gives flames like moon light.”

Preparation of shells/shots (*topas*)

*golo lohamayo garbhagutikaḥ kevalo'pi vā /
 sisaya laghunālārthe hi anyadhātu bhavo'pi vā //
 lohasāramayaṃ vāpi nālāstraṃ tvanyadhātujam /
 nitya sammārjanasvacchamastrapātibhirāvrtam //*
 (ch. 4, sec. 7 vs. 204-205)

“The shells are made of iron balls in which other smaller shells are filled. For guns, shells are made of lead or other metals. The shells for guns are made of steel (*wootz*³) or other metals. The guns have to be cleaned thoroughly and the gunman should stay by its side.”

Firing of Shots

*nālāstraṃ śodhayadadau dadyāt tatragnicūrṇakam//
 niveśayet taddandena nālamule yathā drdham /
 tataḥ sugolakam dadyāt tataḥ karṇe'gnicūrṇakam//
 karṇacūrṇāgni dānena golam lakṣye nipāyayet/
 (ch. 4, sec. 7 vs. 209 ½ -210 ½)*

“First the gun and cannon are to be cleaned, then gunpowder is pressed tightly inside the original chamber with the rod. After that strong shells or metal balls are placed. Gunpowder then filled through its side hole and fire is put on. By this, the shells or balls will burst forth towards its pointed direction.”

Discussion and General Remarks

The use of wooden barrel mentioned for cannon in the text is somewhat unique in its antiquity. Of course the use of bamboo filled with gunpowder is reported to have been used in China in 1132 AD. Metal barrels for hand guns were also used in China towards the end of 13th century AD. The shot *nālīka* instrument appears to be short guns or muskets. For preparation of gunpowder, reagents are more or less common except *suvarcī salt*, which as reported in the *Śukranīti* looks like sugar crystals. What is *suvarcī salt*? It was referred to as materials for purification of gold in the *Arthaśāstra* of Kauṭilya⁴ and used as

an oxydizer which readily burns. There is no doubt that this is saltpetre since this was used to prepare gunpowder. This salt is often confused as Potassium nitrate (KNO_3), Sodium nitrate ($NaNO_3$), Calcium nitrate $Ca(NO_3)_2$ or chlorides and sulphates of Sodium and Potassium. The Calcium and Sodium salts are hygroscopic in nature and render useless in humid atmosphere. The Potassium nitrate is a white non-hygroscopic salt which has three active oxygen atoms per molecule making it an ideal oxydizer when hot. It also occurs in Nature. A standard formula for gunpowder of course is : KNO_3 salt (75%), S (10%), and C (15%). Rocket makers often varied the proportions according to their personal experience. Akbar was aware of the properties of saltpetre both for generating heat (as explosive) as well as coolant for drinks and producing ice⁵. It appears that Akbar had also more or less a fair idea of both hygroscopic and non hygroscopic nature of various salts.

Indian saltpetre was in great demand during the medieval and early modern period. The saltpetre of Bengal, Bihar, Coromandal Coast, Gujarat, Agra, Konkan, Orissa etc. were well known but saltpetre from Bihar near Patna region was in great demand during this period.

REFERENCE

1. The *Sukranīti* was first edited by Gustav Oppert for Madras Government in 1882. Tr. into English by Benoy Kumar Sarkar in the *Secred Book of the Hindus*, No.3, Allahabad, 1914 (subsequently reprinted in 1975). It is not an exact translation but a summary. The text has again been re-edited by B. Misra with Hindi tr. in Kashi Sanskrit Series, No.1, 1985 ; reprinted, fourth edition, Chaukhamba Sanskrit Sansthan, Varanasi, 1997.
 2. *Gāndharva* (seven types) - Dancing, Playing on musical instruments, Decorations, Antics, Laying out beds etc., Jugglery, magic etc., Sexual intercourse.
A yurveda (ten types) - Preparation of alcohol, Surgical operations, Cooking, Gardening, Confectionery, Pharmacy, Metallurgy, Analysis and synthesis of metals, Alloys, Salts.
Dhanurveda (five types) - Employment of arms, Duelling, Marking of aim, Battle arrays, Employment of horses & chariots etc.
Tantra (one type) - Sitting in meditative postures.
- Other *Kalās* (forty one types) - Driving horses and elephants, Teaching horses and elephants, Polishing earthen vessels, Polishing wooden vessels, Polishing stone vessels, Polishing metal vessels, Drawing, Building, Construction of clocks, Clepsedra (*ghaṭī*) and musical instruments etc., Dyeing, Mechanical operations, Putting down

fire etc., Construction of boats and other conveyances, Rope-making, thread spinning, Weaving, Testing of gems, Testing of metals, Preparation of artificial gems and metals, Making of ornaments, Enamelling, Softening of leathers, Flaying of hides, Milking, Churning, Tailoring, Swimming, Cleaning of domestic utensils, Washing, Shaving, Extraction and preparation of oils from fats and seeds, Ploughing, Climbing, Flattering or Entertaining, Canework, Glass-work, Pumping, Work in Iron foundries, Preparation of saddles, Nursing and management of babies, Whipping criminals, Writing in different alphabets, Preparation of betels.

3. J. Le Coze, "About the significance of wootz and other names given to steel" *IJHS*, 38.2 (2003) 117-128.

4. *mukmūṣāpūrtikiṭṭa karaṭakamukhaṃ nālisandaṃśo /
joṅganī suvarcīkā-lavaṇam ityapasāraṇa mārgāḥ //*
(*Arthaśāstra*, 2.14.23)

"A dummy crucible (*mukmūṣā*), foul dross (*pūrtikiṭṭa*), the crane's beak (*karaṭaka mukham*) blow-pipe (*nāli*), a pair of tongs (*sandaśo*), vessel for holding water (*joṅganī*), saltpetre (*suvarcī* salt) etc are used for purification (of gold)".

Suvarcī salt are again referred to in the *Arthaśāstra*, 2.15.15.

5. Arun Kumar Biswas, "Epic of Saltpetre to Gunpowder" *IJHS* 40.4 (2005), this volume.

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