HISTORICAL NOTES

ŚUKRANĪTI ON GUNS, CANNON AND GUNPOWDER

The Śukrāṇīti is a traditional Sanskrit text attributed to Śukrācārya, the sun of Bhṛgu. The author’s identity and his place are not known. Śukrāṇīti 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 viḍyās (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 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, armiyes 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:

*tiryaγ-úrdha cchidra-múlam nálaṁ pañca vitastikaṁ/
múla-agrayorλasyabhedhi tila bindu yutam sadā //
yantrā ghátiγnikrṛ grávacúrantadhr kkarna múlakām /
sukáśhopāngabudhnam ca madhyāṅgulabilāntaram//
svānte 'gnicúrnasanghaṇṭāś alākā samyutam dr̥hma/
laghunālikamapyetat pradhāryam pattisādibhiḥ//

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

"The small nālika-astra (gun) has an oblique (tiryaγ) upward hole throughout the barrel starting from the original (chamber) having length of five vitastis (2-1/2 cubits). It has sharp pointers (tila) 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 tvaksāraṁ yathā sthūla bilāntaram/ yathā dīṛghaṁ bhṛhadgolam dūrabhedī tathā tathā// múla kila bhramāllakṣyasamasāndhānabhājī yat/ bhannālikasariṇaṁ tat kāśṭhabudhnavinirmitam// pravāhyam śakaṭādyaisṭhu suyuktam vijaya(y)apradam/ (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 (bhṛhadgolam) 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 bhṛhad nālika (cannon). If well used it can lead to victory."
Gunpowder preparation:

1) suvarcī-lavanāt pañca palāṇi gandhakāt palam //
antardhūma vipakkārkasnuhi-ādya-āngāratah palam //
śuddhāt saṅgrāhyā samcūrṇyā sammilya praputed rasaih //
snuhi-arkānām rasonasya sōṣayed-ātāpena ca /
pisthvā śarkarāvat 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) suvarcī- lavanād bhāgāh ṣaḍ va catvāra eva vā/
nālastrārtharinicūrṇe tu gandhā angārau 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) āngārasyeva gandhasya suvarcī-lavanasya ca /
śilāyā haritālasya tathā sīsamalasya ca //
hingulasya tathā kāntaraajasah karpūrasya ca /
jatornilyāśca sarala niryāsasya tathaiśa ca //
saṁanyunādi kairamsairagni cūrṇanya nekaśaḥ/
kalpayante ca tadvidyāścandrika bhādīmante ca //
(ch.4, sec.7 vs.205 ½ - 208)

"Charcoal, sulphur, suvarcī salt, mixed with haritāla, lead (sisā),
hingula, kāntisāra lauha (iron filings), camphor (karpur) jatu, indigo extract
(nīlī) 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*)

\[\text{golo lohamayo garbhagutikah kevalo 'pi vā} / \\
\text{sisaya laghunālārthe hi anyadhātu bhavo 'pi vā} / \\
\text{lohasāramayaṁ vāpi nālāstram tvanyadhātujam} / \\
\text{nitya sammārjanasvacchamastrapātibhirāvrtam} // \\
\text{(ch.4, sec.7 vs.204-205)}\]

"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 (\textit{wootz}^2) or other metals. The guns have to be cleaned thoroughly and the gunman should stay by its side."

Firing of Shots

\[\text{nālāstram sodhayedadau dadyāt tatragnicūrnakam}// \\
\text{niveśayet taddandena nālamule yathā dr̥ham} / \\
\text{tataḥ sugolakam dadyāt tataḥ karne'gnicurnakam}// \\
\text{karnacūrnāgni dānena golam laks̄ye nipātayet/} \\
\text{(ch.4, sec.7 vs.209 ½ -210 ½)}\]

"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 \textit{nālika} instrument appears to be short guns or muskets. For preparation of gunpowder, reagents are more or less common except \textit{suvaṛcī salt}, which as reported in the \textit{Śukranīti} looks like sugar crystals. What is \textit{suvaṛcī salt}? It was referred to as materials for purification of gold in the \textit{Arthaśāstra} of Kauṭilya^4 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 (KNO₃), Sodium nitrate (NaNO₃), Calcium nitrate (Ca(NO₃)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 KNO₃ 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 ice³. 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**


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, Clepsendra (*ghati*) and musical instruments etc., Dyeing, Mechanical operations, Putting down


4. *mukmūśāpūrtikītta karāṭakamukham nālisandamśo /
joṅganī suvarcikā-lavāṇam iyyapasāraṇa mārgāḥ //
(Arthaśāstra, 2.14.23)

“A dummy crucible (*mukmūśa*), foul dross (*pūrtikītta*), the crane’s beak (*karāṭaka mukham*) blow-pipe (*nāli*), a pair of tongs (*sandośo*), 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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