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PHONOLOGICAL OVERGENERATION IN PANINIAN SYSTEM

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ABSTRACT

In this paper an attempt is made to study the problem of overgeneration that is caused by the application of the system of $P\bar{a}nini$ The system of $P\bar{a}nini$ is made up of certain rules stated by him and his commentators namely, $K\bar{a}ty\bar{a}yana$ and $Pata\tilde{n}jali$. These rules are supposed to produce the forms that are used in the language, i.e. Sanskrit. However, sometimes the technical application of these rules produces such forms which are not actually used in the language. In fact, sometimes it is beyond human capacities to use such forms. In the present paper two such cases dealing with the phonological overgeneration are studied and possible solutions are proposed to avoid the problem.

1. INTRODUCTION:

It has been demonstrated by Kiparsky and Staal(1988) how Paninian system functions on four levels, namely, semantic, deep structure, surface and phonological. This system however sometimes over-generates in perhaps, some of these levels. Of course $P\bar{a}nini$ (P) has no doubt laid down certain constraints with the help of which the system produces supposedly un-over-generated forms. Prince and Smolensky (2002), have devoted a section on Panini's theorem of constraint ranking (5.3) Of course our judgement regarding the over-generativeness of a rule in the $A\underline{st}adhyayi(A)$, it must be admitted here, is based entirely upon whatever evidance in the form of pre-paninian literature available to us.

2. PHONOLOGICAL OVER-GENERATION

This paper is devoted to phonological over-generation that still happens with all the possible constraints applying. There are two aspects that are studied in this paper,

(1) Nasalization and (2) Phonetic doubling

2.1. Nasalization:

8.4.45 states that yar^1 occurring at the end of a *pada*, is optionally, (*preferably*, according to Kiparsky1980:1) substituted by the nasal, if a nasal follows.

(1) etad murāriḥ = etan murāriḥ / etad murāriḥ ... 8.4.45

 $K\bar{a}ty\bar{a}yana(K)$ has added a $V\bar{a}rttika(V)$ on this rule, to the effect that this nasalization takes place permanently if the following nasal is a part of a suffix (2)

```
tad + maya
= tan-maya ... 8.4.45 + K's V.
= tanmaya
```

2.1.1. Enviornment for nasalization:

However, if we look at the way P has stated this rule, we have to take into account following table which shows clearly all possible environments in which this rule should apply and the possible results in the form of substitution of a nasal consonant. The top row and the left column, in the table, show the possible environment. The bottom row shows the resultant nasal consonant in place of the consonant written in the same column in top row. Thus for

¹These phonemes are- all the stops including the nasals, semi vowels(y, r, l, v) and sibilants except h.

instance,

$$[..y] + [n..] / [m..] / ... 8.4.45 + K's V$$

= $[..y#] + [n..] / [m..] /$

Table 1 shows that any consonant mentioned in the top row occuring at the end of a *pada* and followed by any of the nasal consonants mentioned in the left hand column, is substituted by the nasal consonant shown in the bottom row. # mark is used to show the nasal feature in the bottom row. * shows that these substitutions are not attested in Sanskrit. The order of sounds followed by P in his *pratyāhāra sūtras* is maintained here.

There are certain sounds in this table which are directly not applicable for this operation as they never occur at the end of a *pada* in Sanskrit. Such sounds are- y,l,, i, \tilde{n} , *jh*, *bh*, *gh*, *dh*,*dh*, *kh*, *ph*, *ch*. Some grammatical entries do end in some of these sounds and hence it can be argued that by applying operations related to 0 suffix, one can generate *padas* with these sounds at the end. However, this argument does not hold valid as in the case of these consonants, the other rules namely, 8.2.30, 8.2.39 etc. will substitute them with the other consonants.

Thus consider the following example-

(3)		
gumph		 Dhātupātha 6.31
gumph	+ kvip	 3.2.178
gu ph	+ kvip	 6.4.24
gu ph	+0	 6.1.67
= guph		
guph	+ su	 4.1.1,2
guph	+ 0	 6.1.68
gub		 8.2.39
gub/gup		 8.4.56
1 /		

= gub / gup

In the same way, other consonants will be substituted.

2.1.2. Overgenerated nasalization:

Now the rule, applied to all the remaining consonants should also apply to the following example-

(4) catur mukha catu n mukha	 8.4.45
= catu nmukha	

However, this resultant form is not acceptable in Sanskrit. This is clearly an over- eneration.

8.4.58 states the substitution of a nasal in place of an *anusvāra* when followed by almost same consonants(called as yay by P) mentioned in the top row of

Table 1 above except the last three. The rule can be shown as-

$$\begin{bmatrix} \dots anusv\bar{a}ra \end{bmatrix} + \begin{bmatrix} yay \dots \end{bmatrix} \\ = \begin{bmatrix} \dots nasa \end{bmatrix} + \begin{bmatrix} yay \dots \end{bmatrix}$$

Thus by applying this rule we get forms like *kantha*, *aìkita*, *gumphita* etc. Consider however, the following example-

(5) kundam rathena kundam rathena ... 8.3.23 kundan rathena ... 8.4.58

The resultant form here is not acceptable in Sanskrit. This is again over-generation.

One may argue about redundancy being the feature of use of the *pratyāhāra*s in the metalangauge of However, the tradition has taken pains in creating a constraint to check such forms in the form of statements in this regard. Pa in the context of the above example says-

*rephosmaņām savarņā na santi*². (the sounds r and the sibilants do not have any homogenious(nasal))

There are at least some constraints in the form of statements of the later commentators to check the overgeneration as shown above. However, in the case of phonetic doubling mentioned below, we see hardly any constraint to check the overgeneration.

2.2. Phonetic doubling:

P in his A has dealt with the process of reduplication at three places; (i) 6.1.1-12³, (ii) 8.1.1-15, (iii) 8.4.46-52. (i) deals with the reduplication of verbal roots in the forms of present as well as perfect tense and also in forming complex verbal roots such as desiderative and frequentative. In a nutshell, this reduplication applies to the *aiga* in Paninian terminology. (ii) deals with the reduplication of the entire pada. The last section in the A mentioned above, deals with the reduplication of the consonants. The paninian tradition has augmented the existing set of rules laid down by P in this section, in the form of Vārttikas (maily written by K) in this regard and the later tradition has interpreted certain statements of Patañjali(Pa) in such a manner that the resultant forms can only be termed as over-generated ones. The later paninian tradition has done this exercise at many places and has come up with such overgenerated

²VyākaraëaMahābhāsya of Patañjali, 2001, Vol.1, p 130.

³More recently, Kiparsky in a forthcoming article available on his webpage, has discussed it.

																					D **	••••										
	у	v	r	1	ñ	m	'n	ņ	n	jh	bh	gh	dh	dh	j	b	g	ġ	d	kh	ph	ch	ţh	th	с	ţ	t	k	р	ś	ş	s
'n																																
ñ																																
ņ																																
n																																
m																																
	у	v	ņ	1	ñ	m	'n	ņ	n	ñ	m	ń	ņ	n	ñ	m	'n	ņ	n	'n	m	ñ	ņ	n	ñ	ņ	n	'n	m	ñ	ņ	n
	#	#	*	#																										*	*	*

Table 1: Consonants and their substitutes according to 8.4.45

Table 2: Enviornment for Phonetic doubling

1	2	3 Consonant	4	Rule of Panini
		Reduplicated		
vowel	r/h	yar	_	8.4.46
_	vowel	yar	No vowel	8.4.47
vowel	Yan	may	—	K & Pat on
				8.4.47
vowel	may	yan	_	As above
—	Ś ar	khay	—	As above
_	khay	Ś ar	_	As above

forms. The such extreme cases are presented in this paper and an attempt is made to study the approach of the Paninian system to handle this phenomenon.

(6) putrādinī tvam asi pāpe
(Oh! son-eater woman, shame on you!) puttrādinī sarpiņī
(she-snake is son-eater.)

In this case, t is seen reduplicated alongwith the change in the meaning. This case is noted by 8.4.48.

2.2.1. Enviornment for Phonetic doubling:

In the same section, some other phonemes are also noted for their reduplicated occurrence. K and pat have also noted down this tendency in some other phonemes. These phonemes are- same mentioned in fn 2. In table 2 they are referred to as *yar*, as used by P. In the table 2, these rules are explained with all details, namely environments- prior and posterior

Here 1, 2, 4 refer to the environment for phonetic doubling. The order indicates the positions of these environments and the position of the phoneme reduplicated. The examples for these two rows are-

```
(7) haryyanubhavah
(h \overline{a-r-y} anubhavah > phonetic doubling of y)
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(b) s<u>udhdh</u>yupāsyaḥ
 (s-u-dh-y upasyah > phonetic doubling of y).

2.2.2. *K* and *Pa* on the environment for phonetic doubling:

While commenting upon 8.4.47, K notes- *dvirvacane yano mayah*. On this Pa has a two fold comment. He says-

dvirvacane yano maya iti vaktavyam. Kim udāharaņam yadi yaņa iti pañcamī maya iti şasthī ulkkā valmmikam ity udahāraņam. Atha maya iti pancamī yaņa iti şasthī dadhyyatra madhvvatrety udāharaṇam

This means- In the rules dealing with the process of phonetic doubling, the words yano mayah should be stated. What is the example ? If yanah (yan is y, v,r, l) is taken to be ablative and mayah (may is all stops except nasal palatal) is taken to be genitive, then the examples are –

(9) u<u>lkk</u>ā / va<u>lmm</u>ikam

and if *mayah* is taken to be ablative and *yanah* is taken to be genitive, then the examples are-

(10)*dadhyyatra / ma<u>dhvv</u>atra*.

Same argument is applied to another statement of K, namely $\delta arah khayah^4$ which provides us with the following examples-

(11) <u>sthth</u>ālī / <u>sthth</u>ātā

(12) va<u>tss</u>aḥ / <u>kss</u>īram / a**p**ssarāḥ

This way of interpreting the statements of K on the rules of P becomes a peculiar feature of the system of paninian grammar. Later tradition of paninian grammar thus by interpreting statements of K and Pa and

 ^{(8) (}a)rāmātt (rām ā-t-(no vowel) > phonetic doubling of t)

⁴This statement means that *khay* is reduplicated if it occurs after *s*ar and *s*ar is reduplicated if it occurs after *khay*. *s*ar stands for all the sibilants except h and *khay* stands for all the voiceless stops.

P have noted down forms which we here address as overgenerated forms.

We note that this feature is also noted by nonpaninian systems such as $K\bar{a}tantra$. A commentary on *PrakriyāKaumudī* namely *Prakāś a* notes that according to *Kātantra* school the phonetic doubling in a particular case will give rise to only 32 forms and not more⁵.

2.2.3. Twice Occurences of same consonant in Sanskrit

It is noteworthy to study the structure of the consonant cluster in Sanskrit. A list of such clusters is available in Coulson Michael, 2003, p 22-24. We concentrate on a cluster of two consonant of same phonetic value. In other words, we concentrate on the twice occurrence of the same consonant. In the table 3, a list of such consonant clusters is provided. Table 3 shows us the consonants which can have twice occurrence without applying the rules of phonetic doubling.

Table 3: Twice occurences of same consonant

k	(i)Final + initial of the next word
	(ii)Prefinal
8	Final + initial of the next word
С	Final + initial of the next word
j	Final + initial of the next word
t	Final + initial of the next word
d	Final + initial of the next word
p	Final + initial of the next word
b	Final + initial of the next word
'n	Final + initial of the next word
п	(i) Final + initial of the next word
	(ii)Pre-final
'n	Final + initial of the next word
т	Final + initial of the next word
´s	Final + initial of the next word
.s	Final + initial of the next word
S	Final + initial of the next word

A careful glance at table 3 will point out that all these consonants fall in the domain of the application of the phonetic doubling rules mentioned above in Table 2. Therefore, if the rule for phonetic doubling is applied to these already existing two consonants, we get three same consonants occurring one after another. Such a form is noted to exist optionally by P in the case of consonants except nasals by the 8.4.65. 2.2.4. Generation of Phonetic doubling in later tradition:

A 17th century grammar text, *Vaiyākaraņa-SiddhāntaKaumudī* (VSK) records following cases of phonetic doubling-

(13) $r\bar{a}m\bar{a}tt r\bar{a}m\bar{a}dd.$ / VSK 206, *dvitve rūpacatustayam*. (in the forms $r\bar{a}m\bar{a}t$ and $r\bar{a}m\bar{a}d$, after applying the rules of phonetic doubling we get 4 forms).

(14) aidhidhvam / VSK 2258, dhadhayor vasya masya ca dvitvavikalpātsodasar $\bar{u}p\bar{a}ni$. (by reduplicating v and m when immediately before dha and dha we get 16 forms.)

(15)samskartā / VSK 138, anusvāravatām anusvārasyāpi dvitve dvādasa. (after reduplicating the anusvāra in the forms already containing it, we get 12 forms).

(16) gavāk / VSK 443

Cases (15) and (16) deserve a special attention as they pose a problem.

2.2.4.1. 2.2.4.1 Generation of Phonetic doubling in the forms of samskartā

(15) samskartā - This word is formed in the following way⁶-

sam + kartā		
sam + s- kartā		6.1.134
sar + s-kartā		8.3.5
samr + s-kartā		8.3.2 / 8.3.4
saṃs + s-kartā		8.3.15
	-	

Along with this form there is an optional form that is available in which in place of m there occurs an *anusvāra*. In the following two tables (Table 4 and Table 5), forms with m and *anusvāra* are presented.

In Table 4 and 5, we see phonetic doublings of s, t, k and more problematically of the *anusvāra*. This phonetic doubling of *anusvāra* is based on the argument of K that $ayogavāha^7$ s are to be included in the *pratyāhāra aṭ* as well as *śar* by the statement*ayogavāhānam aṭsuņatvam śarsu jaś tvasatve*.

⁵PrakriyāKaumudī, 2000, Vol.I, p 158.

⁶I have to turn to Devnagari fonts for these two case to stress the amount of problem.

⁷The term *ayogavāha* refers to *anusvāra*, *visarga*, *jihvāmulīya and upadhmānīya*, Vy\=akaraëaMahābhāṣya of Patañjali, 2001, Vol.1, p 132.

Table 4:	Forms	of	samskartā	with a	first nasal	vowel
			•			

Forms	Explanation
संस्कर्ता	Deletion of first s - comment of Pa-samo
संस्स्कर्तां	vā lopam ity eke Mbh. on P.8.3.5
सैस्स्कर्तां	Phonetic doubling of 1st s by P.8.4.47
संस्कर्तां	Phonetic doubling of k-sarah khayah
संस्स्वता	referred to in Table 2 shove
संररखतां	10101100,00 111 1 0010 2 00070.

<u>Forms</u> संस्कृत्तां संस्स्कृतां संस्स्स्कृतां संस्कृतां संस्स्स्कृतां संस्स्स्कृतां Phonetic doubling of *t* in all the above 6 forms by *dvir vacane yano mayah*

<u>Forms</u> संस्कृततों संस्स्कृततों 2nd Phonetic doubling of *t* in the first 6

forms by dvir vacane yano mayah

	संस्कर्ता	सँस्स्कताँ	सँस्स्स्कर्ता
Forms	संस्कृतौ	संस्स्वताँ	सँस्रस्कर्तां
	संस्कत्ताँ	संस्स्कत्ताँ	सँस्स्कत्ताँ
	संस्कृत्ताँ	संस्रकताँ	सँस्स्चत्ताँ
	संस्कक्ताँ	संस्स्कक्ताँ	सँस्स्स्कक्ताँ
	संस्वत्ताँ	संस्स्वत्ता	संस्टस्वक्तौ
	N asaliz	ation of th	e final vowel by 8.4.57 in
	all the 1	2 form s n	ientioned above. In all,
	we hav	e 24 forms	in this row.

2.2.4.2. 2.2.4.2 Generation of Phonetic doubling in the forms of Gavāk

The *Paninian Dhātupātha* notes that the root anc is used in two senses viz. *gati*(to go) and $p\bar{u}jana$ (to worship/respect). In the sense of 'one who goes to a cow' and in the sense of 'one who worships a cow', the derivations that take place according to the rules of A are shown in the table 6 and table 7 respectively.

In the above tables, the underlined forms are the forms of a noun derived from a verbal root. Note that the difference in the forms in these tables is a mere n which

Table 6: Derivation of $Gav\bar{a}k$ (one who goes to a cow)

20	+ añc		(in the sense of to go)
o~ on	$+ a\tilde{n}c + kvin$		A 3259
80 90	+ ac		A 6 4 24 A 6 1 67
g0 aoc	lao ao		A 6 1 123
goe	/ go uc		A 0.1.123
goc	$\frac{1}{2}$ gavac 7 go ac	• • •	A.0.1.109,122,123,

Table 7: Derivation of *Gavāñc* (one who worships a cow)

go	+ añc	 (in the sense of to go)
go	+ añc + kvin	 A. 3.2.59
go	+ añc	 A 6.1.67
goñc	/ gava añc	 A 6.1.123
goñc	/ gavāñc / go añc	 A.6.1.109,122,123,

has brought about a sea of change in the meaning as well as the form itself. That is why P has noted them with all their variations.

When we take these 6 forms as the base and start adding the *sup* terminations, we get tables 8 and 9 for these two tables. Tables 8 and 9 correspond to Tables 6 and 7 mentioned above. These are the forms in neuter gender. There are certain specific processes for neuter forms. That is why they are selected here. In these tables, in each slot, there are many optional forms shown. They result out of the optional application of the rules namely, 6.1.109, 6.1.122 and 6.1.123.

The final square in Table 9 has got 9 forms. The last 3 forms are a result of the application of the statement of K^8 according to which the 1^{st} class consonant is replaced by the 2^{nd} class consonant of the same class. Thus we see here k is replaced by kh. These are the forms, we can say on the authority of A and K, which are actually spoken by people. So far there is no problem. When we apply the rules of phonetic doubling of certain consonants to these abovementioned Table 8 and 9, we start facing a problem.

2.2.4.3. Effects of phonetic doubling on forms in Tables 8 and 9:

In Table 10 and 11 (as shown in the appendix), the reduplicated forms of the forms mentioned in Table 8 and 9 respectively are presented.

In the table 10 (as shown in Appendix), we note that the phonetic doubling of k, g, \tilde{n} , , y, m has increased the number of forms (which are indicated in each square).

⁸cayo dvitīyā śari pauṣkarasādeḥ / on 8.4.48

The reasoning for the phonetic doubling of k, g, \tilde{n} is 8.4.47. The reasoning for the phonetic doubling of y and m is the same as mentioned in Table 5 namely, *dvirvacane yano mayah*. We also note that there is a phonetic doubling of even a *visarga* in certain forms. The reasoning for this phonetic doubling is same as mentioned after Table 5, namely, inclusion of *visarga* in the *pratyāhāra yar*. Also there is nasalization which is marked by a sign on certain forms which has added those many forms.

We note that in the table 11 (as shown in the Appendix) the following consonants apart from the ones mentioned in Table 7 are reduplicated- i, s. The reasoning for phonetic doubling of i is 8.4.47 and for s is the one mentioned in Table 4. namely, s arah khayah. We also note that in some forms even the *visarga* is reduplicated like in the previous table. In Table 10 and 11 (as shown in the Appendix), we also note that in some forms three consonants are simultaneously reduplicated. We also see that nasalization is marked with the sign in some forms.

Thus if we compare the tables 10 and 11 (as shown in the Appendix) statistically we come up with the following picture-

Unduplicated	Duplicated + Nasalized
49 (Table 8)	196 (Appendix: Table 10)
69 (Table 9)	267 (Appendix: Table 11)

If we are adopting the Paninian framework for generating forms by machine we will face similar problems if we apply the rules of phonetic doubling.

3. PROPOSED SOLUTION :

This overgeneration of forms is caused by-

- (i) redundency of the *pratyāhāra*.
- (ii) application of the rules of phonetic doubling mechanically.
- (iii) application of statements and interpretations of later paninian commentators.

To solve this problem we propose the following:

If we are going to apply the rules of phonetic doubling we must make a rule that -

R1 The visarga should never be reduplicated.

- R2 An anusvara should never be reduplicated.
- R3 The rule of phonetic doubling should not be applied more than once to one consonant.
- R4 The rule of phonetic doubling should not be applied to more than one consonant simultaniously.

In order to remove the redundency, we have to rely upon the statements of the later comentators and take note of their statements and modify the rule accordingly.

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Abbreviations

А	-	Astādhyāyī
Κ	-	Kātyāyana
Р	-	Pāņini

- Pa Patañjali
- V Vārttika
- VSK Vaiyākaraņa-Siddhānta-Kaumudī

	1	2	3
1	गोऽक्क् गोऽग्ग् गोअक्क् गोअग्ग् गवाम्बर् गवाग्ग् 6	गोची	गोऽव्यि गोऽव्यि गोऽर्थि गोअव्यि गोअव्यि गोअस्त्रि गवाव्यि गवाव्यि गवाश्चि १
2	गोऽक्क् गोऽग्ग् गोअक्क् गोअग्ग् गवन्क् गवाग्ग् 6	गोची	गोऽब्दि गोऽब्दि गोऽद्वि गोअब्दिन्न गोअब्दि गोअन्नि गवाविन्न गवाब्त्रि गवान्नि १
3	गोचौ	गोइगभ्याम् गोइगभ्याम् गोइगभ्य्याम् गोअगभ्याम् गोअगभ्याम् गोइगभ्य्याम् गन्नाउर्व्याम् गन्नाप्रभगत्नाम् गन्नाउर्व्याम् गन्नाप्रभगत्नमम् गोजगभ्याम् गन्नाप्रभगत्नमम् गोजगभ्याम् गन्नाप्रभगत्नमम् गोन्नगभ्याम्म् गोऽगभ्याम्म् गोन्नगभ्याम्म् गोजगभ्याम्म् गोन्नगभ्याम्म् गोन्नग्र्याम्म् १२३	गोड मिनाः गोड मिनाः गोड मिनाः गोडमिनाः गोअगिनाः गोअगिनाः गोअगिनाः गोअगिनाः गवागिनाः गद्यागिन्नाः गवागिनाः गद्यागिन्नाः 12
4	गोचे	Same as above 24	गोइ ग्रन्थः गोइ मभ्यः गोइ म्ल्याः गोइ म्ल्याः गोअग्भ्यः गोअग्भ्यः गोअग्ल्याः गोअग्भ्य्याः गवाग्भ्यः ग्रह्ममभ्यः ग्रह्माग्ल्याः ग्रह्माग्भ्य्याः गोइ ग्भ्यः गोइ मभ्यः गोइ ग्ल्याः गोड ग्ल्याः गोअग्भ्यः: गोड मभ्यः गोड ग्ल्याः गोअग्भ्य्याः गवाग्भ्यः ग्रह्माग्भ्यः: गह्माभ्य्याः गह्माग्भ्य्याः 24
5	गोचः	Same as above (24.)	Same as above 24
6	गोचःः	ोोचोः:	्रम्मार्जार
7	गोचि	गोचोःः	। गोऽख्न गोऽक्ष्यु गोऽक्ष्यु गोऽक्ष्रुष्ट्र गोऽख्नुं गोऽख्नुं गोऽख्नुं गोआख्न गोअक्ष्यु गोआक्ष्रु गोअक्ष्रुच गोआक्षुं गोअक्ष्रुं गोआक्ष् गवाख्न गवाक्ष्य गवाक्ष्यु गवाक्ष्यु गवाक्षुं गवाक्षुं गवाक्ष्युं गवाक्ष्युं गोअक्ष्रक्षुं गोअक्ष्रक्षुं 24

Appendix: Table 10:Phonetic doubling in the declension of *Gavāc*

1	गोऽङ्ख्	गोऽ-ज्ज्ञी	गोऽिखगोऽिखें गोऽधिं
	गोअङ्ख्	गोअन्ज्ज्ञी	गोअव्धि गोअव्धिं गोअधिं
	गवाङ्ख्	गवाञ्ज्ञी	गवाव्धि गवाव्धिं गवाधिं 9
2	गोऽहङ्ख्	गोऽउन्ह्री	गोइ टिख गोइ टिखेंगोइ खिं
	गोअहङ्ख्	गोअञ्ब्री	गोलटिख गोलटिखें गोलखिं
	गवाहङ्ख्	गवाञ्त्र्वी	गवाटिख गवाटिखेंगवाखिं 9
3	गोधज्ञी गोधच्ज्रा गोधच्छो	गोऽङ्भ्याम् गोऽङ्ङ्भ्याम् गोऽङ्भ्य्याम्	गोऽहि मः: गोऽहिरू मः गोऽहिरू मः:
	गोअज्ञी गोअच्ज्रा गोअच्छो	गोअङ्भ्याम् गोअङ्ङ्भ्याम् गोअङ्भ्य्याम्	गोअहि मः: गोअहिरू मः गोअहिरू मः:
	गवाज्ञी गवाच्छा गवाच्छी 9	गवाङ्भ्याम् गवाङङ्भ्याम् गवाङ्भ्य्याम्	गवाहि मः: गवाहिरू मः: गवाहिरू मः: ९
4	गोऽञ्झे	गोऽह्भ्यामम् गोऽह्ङ्भ्य्याम् गोऽह्ङ्भ्य्याम्म्	गोऽहभ्यः गोऽङ्कुभ्यः गोऽङ्भय्याः गोऽङ्भ्याः
	गोअञ्झे	गोअङ्भ्यामम् गोअङ्ङ्भ्य्याम् गोअङ्ङ्भ्य्याम्म्	गोअङ्भ्यः गोअङ्कुभ्यः गोअङ्भ्य्याः गोअङ्भ्याः
	गवाञ्झे	गवाङ्भ्याम्म् गवाङङ्भ्य्याम् गवाङङ्भ्य्याम्म्	गबाङ्भ्यः गबाङ्क्य्यः गबाङ्भ्य्याः गबाङ्भ्याः
5	गोधन्नःः गोधञ्ज्ञः गोअन्नःः गोअञ्ज्ञः गवान्नःः गवाञ्ज्ञः6	गोऽहह्रभ्याम्म् गोऽ <i>ह्</i> भ्य्याम्म् गोअइ.हुभ्याम्म् गोअङ्भ्य्याष्म् गवाहहूभ्याम्म् गवाङ्भ्य्याम्म् 24	गोऽडङ्ग्स्याः गोऽङड्स्याः गोऽङ्स्याः गोअङ्ङ्भ्याः गोअङ्ड्स्याः गोअङ्स्याः गवाङड्स्याः गवाङड्स्याः गवाङ्स्स्याः ²⁴ गोऽङड्भ्याः गोअङ्क्ष्य्याः गवाङड्भ्याः
6	same as above 6	गोऽग्रोः: गोऽञ्ज्रोः गोऽञ्ज्रोः: गोअन्न्रोः: गोअञ्ज्रो: गोअञ्ज्रोः: गवान्नोः: गवाञ्ज्रो: गवाञ्ज्रोः: 9	गोऽञ्चाम्म् गोऽब्झाम् गोऽब्झाम्म् गोअञ्चाम्म् गोअब्झाम् गोअब्झाम्म् गत्राज्यम् गतब्द्धम् गतब्द्धम् ७
7	गोऽन्नि गोऽव्झि गोऽव्झि	गोऽन्नोः: गोऽञ्चोः गोऽञ्चोः:	गोऽदङ्ध्रं गोऽदङ्घ्र गोऽदङ्घ्रु गोऽदङ्घ्रु गोऽदङ्घ्रु
	गोअन्नि गोअव्झि गोअव्झि	गोअन्नोः: गोअञ्चोः गोअञ्चोः:	गोऽद्ध्र्यं गोऽद्ध्र्यु गोऽद्र्घ्यु गोअदङ्घ्रु
	गवान्नि गवाव्झि गवाव्झि १	गवान्नोः: गवाञ्चोः गवाञ्चोः: ⁹	गोअदङ्घ्रं गोअदङ्घ्रु गोअदङ्घ्रु गोअदङ्घ्रु
ม ม มี มี	ोऽङ्ख्स्सु गोऽङ्ख्राज्यु गोऽङ् ोऽङ्ख्युं गोऽङ्स्युं गोअङ्ख्स्यु ोअङ्ख्यज्यु गोअङ्ख्रुं ोअङ्ख्यज्युं गोअङ्ख्र्युं	र्षे गोऽदङ्ख्यै गवाङ्यै गोअद्ख्यै गवाद्द्ख्य गोऽद्ख्यौ गवाद्ख्यौ गोअद्ख्यौ ववाद्द्ख्यै गोअहद्ख्यै गवाद्ख्यौ गवाहद्ख्यै गोअहद्र्ख्यौ ⁵¹ गोअह्द्र्य्यौ गवाह्द्य	गवाङ्ड्रम्यु गोऽडर्लघु गवाङ्ड्यु गवाडड्स्यु गवाङड्स्यु गवाड्र्स्यु गवाड्र्स्यु गवाडर्ल्यु गवाङ.र्ल्यु गोअङ्ग्रु गोऽडड्स्यु गोऽड्ड्स्यु गोऽड्ड्स्यु श्रु गवाङ्ड्रल्यु

Appendix: Table 11: Phonetic doubling in the declension of Gavāñc