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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 Pannini The system of Pānini is made up of certain rules stated by him and his commentators namely, Kātyāyana and Patañjali. 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 Pānini (P) has no doubt laid down certain constraints with the help of which the system produces supposedly un-overgenerated 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 Astāādhyāyl $\bar{l}(\mathrm{~A})$, 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 par $^{1}$ occurring at the end of a pada, is optionally, (preferably, according to Kiparsky1980:1) substituted by the nasal, if a nasal follows.
(1)
etad murārih
= etan murārị̣ / etad murārị̣ ... 8.4.45
Kātyāyana(K) has added a $\operatorname{Vārttika(V)~on~this~}$ rule, to the effect that this nasalization takes place permanently if the following nasal is a part of a suffix
(2)

$$
\begin{aligned}
& \text { tad }+ \text { maya } \\
& =\text { tan-maya } \\
& =\text { tanmaya }
\end{aligned}
$$

### 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

[^0]instance,
\[

$$
\begin{array}{llll}
{[. . \mathrm{y}]} & +[\mathrm{n} . .] /[\mathrm{m} . .] / & . . & 8.4 .45+\text { K's V } \\
=[. . \mathrm{y} \#] & +[\mathrm{n} . .] /[\mathrm{m} . .] / &
\end{array}
$$
\]

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 $\operatorname{are}-\mathrm{y}, 1,, i ̀ \tilde{n}, j h, b h, g h, d h, d h, k h, p h, c h$. 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 |  | $\ldots$ | Dhātupātha 6.31 |
| gumph | + kvip | $\ldots$ | 3.2 .178 |
| guph | + kvip | $\ldots$ | 6.4 .24 |
| guph | +0 | $\ldots$ | 6.1 .67 |
| guph |  |  |  |
| guph | + su | $\ldots$ | $4.1 .1,2$ |
| guph | +0 | $\ldots$ | 6.1 .68 |
| gub |  | $\ldots$ | 8.2 .39 |
| gub/gup |  | $\ldots$ | 8.4 .56 |
| 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 ...... 8.4.45
catu n mukha
= catu ṇmukha
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-

$$
\begin{array}{ll}
{[\ldots \text { anusvāra }]} & +[\text { yay } \ldots] \\
=[\ldots \text { nasal }] & +[\text { yay } \ldots]
\end{array}
$$

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

| $\begin{array}{l}\text { (5) } \\ \text { kundam rathena } \\ \text { kundaṃ rathena }\end{array}$ | $\ldots$ | 8.3 .23 |
| :--- | :--- | :--- |
| kundaṇ rathena | $\ldots$ | 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 pratyāhāras 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-
rephoṣmañām savarṇā 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 ${ }^{3}$, (ii) 8.1.1-15, (iii) 8.4.4652. (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 aìga 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 $(\mathrm{Pa})$ 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

[^1]Table 1: Consonants and their substitutes according to 8.4.45

|  | y | v | r | 1 | ñ | m | ṅ | ṇ | n | jh | bh | gh | ḍ | dh | j | b | g | d | d | kh | ph | ch | th | th | c | ! | t | k | p | S | s | s |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ṅ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ñ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| m |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | y | v | ! | 1 | ñ | m | ṅ | ṇ | n | ñ | m | ṅ | n | n | ñ | m | ṅ | ṇ | n | ṅ | m | ñ | ṇ | n | ñ | n | n | ṅ | m | ก̃ | ṇ | n |
|  | \# | \# | * | \# |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | * | * | * |

Table 2: Enviornment for Phonetic doubling

| $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ Consonant <br> Reduplicated | $\mathbf{4}$ | Rule of Panini |
| :--- | :--- | :--- | :--- | :--- |
| vowel | $r / h$ | yar | - | 8.4 .46 |
| - | vowel | yar | No vowel | 8.4 .47 |
| vowel | Yan | may | - | K \& Pat on <br> 8.4 .47 |
| vowel | may | yan | - | As above |
| - | Śar | khay | - | As above |
| - | khay | Sar | - | 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!)
puttrādinū sarpiṇ̄
(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
(ha-r-y anubhavah $>$ phonetic doubling of $y$ )
(8) (a)rāmātt
$(r \bar{a} m \bar{a}-t$-(no vowel) $>$ phonetic doubling of t$)$
(b) sudhdhyupāsyah
(s-u-dh-y upasyah $>$ phonetic doubling of y ).

### 2.2.2. $K$ and $P a$ on the environment for phonetic doubling:

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

> dvirvacane yaṇo maya iti vaktavyam.
> Kim udāharaṇam yadi yana iti
> pañcamī maya iti sasth $\bar{\imath}$
> ulkkā valmmikam ity udahāraṇam. Atha maya
> iti pancamī yaṇa iti saṣth̄̄
> dadhyyatra madhvvatrety udāharanam

This means- In the rules dealing with the process of phonetic doubling, the words yano maya $h$ 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) ulkk $\bar{a} /$ valmmikam
and if mayah is taken to be ablative and yanah is taken to be genitive, then the examples are-
(10)dadhyyatra / madhvvatra.

Same argument is applied to another statement of K, namely śarah khayah ${ }^{4}$ which provides us with the following examples-
(11) sththā $\bar{l} /$ sthth $\bar{a} t \bar{a}$
(12) vatssah / kssīram /apssarāh

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

[^2]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 Kātantra. A commentary on PrakriyāKaumud̄̀ namely Prakāśs a notes that according to Kätantra school the phonetic doubling in a particular case will give rise to only 32 forms and not more ${ }^{5}$.

### 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 <br> (ii)Prefinal |
| :--- | :--- |
| $g$ | Final + initial of the next word |
| $c$ | 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 |
| $n$ | (i) Final + initial of the next word <br> (ii)Pre-final |
| n | Final + initial of the next word |
| $m$ | Final + initial of the next word |
| ' | 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.

[^3]
### 2.2.4. Generation of Phonetic doubling in later tradition:

A $17^{\text {th }}$ century grammar text, VaiyākaraṇaSiddhāntaKaumud̄̄ (VSK) records following cases of phonetic doubling-
(13) rāmātt rāmādd./ VSK 206, dvitve rūpacatuṣtayam. (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 dvitvavikalpātṣodaṣarūpāṇi. (by reduplicating $v$ and $m$ when immediately before $d h a$ and $d h a$ we get 16 forms.)
(15)saṃskartā / 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 samskart $\bar{a}$

(15) samskart $\bar{a}$ - This word is formed in the following way ${ }^{6}$ -

| sam + kart $\bar{a}$ |  |  |
| :--- | :--- | :--- |
| sam + s-kart $\bar{a}$ | $\ldots$ | 6.1 .134 |
| sar + s-kart $\bar{a}$ | $\ldots$ | 8.3 .5 |
| saṃr + s-kart $\bar{a}$ | $\ldots$ | 8.3 .2 / 8.3.4 |
| saṃs + s-karta | $\ldots$ | 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 ${ }^{7} \mathrm{~s}$ are to be included in the pratyāhāra at as well as śar by the statementayogavāhānam atṣuṇatvam śarṣu jaś tvaṣatve.

[^4]Table 4: Forms of samskartā with a first nasal vowel

| Forms | Explanation |
| :---: | :---: |
| संस्कतां | Deletion of first s - comment of Pa -samo |
| संस्सक्कतां | $v \bar{a}$ lopam ity ehe Mbh. on P.8.3.5 |
| संस्स्स्कतां | Phonetic doubling of $1^{\text {st }} s$ by P 8.4 .47 |
| संस्बतां <br> संस्स्क्छतां <br> संस्स्स्बतां | Phonetic doubling of $k$-sar ah khayath referred to in Table 2 above. |

Forms
संस्कत्तां संस्सकत्तां संस्स्कत्तां
संस्क्त्तां संस्स्कत्रiं संस्स्स्कत्रiं
Phonetic doubling of $t$ in all the above 6
forms by dur vacane yano mayah
Forms संस्बत्त्तां संस्स्क्रत्तां संस्स्स्कत्तां
$2^{\text {rd }}$ Phonetic doubling of $t$ in the first 6
forms by dvir vacane yano mayah

| Forms | संस्कताँ | संस्सकताँ | संस्स्स्कताँ |
| :---: | :---: | :---: | :---: |
|  | संस्बतता | संस्स्बताँ | संस्स्स्क्छताँ |
|  | संस्कत्तां | संस्स्कत्तां | संस्स्स्कत्ता' |
|  | संस्बक्त्तां | संस्स्बत्ताँ | संस्स्स्क्षत्ता' |
|  | संस्कत्ताँ | संस्स्कत्त्तॉ | संस्स्स्कत्त्ता |
|  | संस्क्बत्ताí | संस्स्बक्त्तां | संस्स्स्क्बत्तां |

Nasalization of the final vowel by 8.4 .57 in
all the 12 form s mentioned above. In all,
we have 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 añc is used in two senses viz. gati(to go) and pūjana(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 Gavāk (one who goes to a cow)

| go | $+a \tilde{n} c$ | $\ldots$ | (in the sense of to go ) |
| :--- | :--- | :--- | :--- |
| $g o$ | $+a \tilde{n} c+k v i n$ | $\ldots$ | A. 3.2.59 |
| $g o$ | $+a c$ | $\ldots$ | A 6.4.24, A.6.1.67 |
| goc | Igoac | $\ldots$ | A 6.1.123 |
| $\underline{g o c}$ | I gavāc/goac | $\ldots$ | A.6.1.109,122,123, |

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

| go | + añc | $\ldots$ | (in the sense of to go ) |
| :--- | :--- | :--- | :--- |
| go | + añc + kvin | $\ldots$ | A. 3.2.59 |
| go | + añc | $\ldots$ | A 6.1.67 |
| goñc | I gava añc | $\ldots$ | A 6.1.123 |
| goñc | I gavã̃̃ / go añc | $\ldots$ | 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 $\mathrm{K}^{8}$ according to which the $1^{\text {st }}$ class consonant is replaced by the $2^{\text {nd }}$ class consonant of the same class. Thus we see here $k$ is replaced by $k h$. 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).

[^5]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

A - Astūadhyāȳ̄
K - Kātyāyana
P - Pānini
Pa - Patañjali
V - Vārttika
VSK - Vaiyākaraṇa-Siddhānta-Kaumud̄̄

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

| 1 | 2 | 3 |
| :---: | :---: | :---: |
|  | गोनी <br> गोची |  <br>  <br>  <br>  <br>  <br>  |
| $3 \text { गोन्चो }$ | गोड गक्याम् गोडाग＋याम् गोइ गक्य्याम् गोअग＋्याम् गोअ ग्यद्यम् गोसग ग्यक्याम् गबाग＋्याम् गबाग्य स्याम् गबएगय्याम् गोड ग्य्याम् गोड ग्यान्म् नोड ग्ययान्म् <br>  <br>  <br>  <br>  <br>  | गोड $\mathrm{F}+7$ ：गोड C <br>  <br>  |
| $\begin{array}{ll} \hline 4 \\ \text { गोचे } \\ 5 & \text { गोच: } \end{array}$ | Same as above 24 <br> Same as above（24） |  <br>  <br>  <br>  <br>  <br>  24 Same as above 24 |
| 6 गोच： | गोनोः： | गोणाम्नL |
| गो⿰⿱⺈⿵⺆⿻二丨⿱刀⿰㇒⿻二丨䒑口合 | गोनोः |  <br>  <br>  गोड क्स स्ब <br> गोसकस्स 首 |

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

|  |  |  |
| :---: | :---: | :---: |
| 1 गोड्ह्ह गोअह्द्र गबह्ह्ह | गोऽ ब्द्री <br> गोअन्द्री <br> गबाब्द्री | गो5 द्बस गो5 <br>  <br>  |
| 2 गोडह्द्र गोअद्ध गब展 | गोड ㅇ्बी <br> गोअनझ्री <br> गबाब्द्री |  गोर्सीस्स्य गोअंख्य गोজी <br>  |
| 3 गोऽ घ्वो गोइ ब्स्रा गोऽ ब्ब्रो गोअव्द्रो गोझब्द्रा गोअब्द्रो <br>  | गोइ ह््याम् गोऽ ह्द्र्य्यम् गोऽड्र्म्याम् गोअह्म्यम् गोअह्ट्र्म्याम् गोअह्म्य्याम् गबाह्क्याम् गताहह्क्याम् गबाइ्य्याम् |  <br>  <br>  |
| 4 गो5 बसे <br> गोअळ्शे गदाइसे |  गोअह्म्यान्म् गोभह्ड्य्य्याम् गोअह्ड्र्म्याम्म् गबाइ्याम्मप्गबहह्न्यनाम् गबाहर्ह्य्याम्म् | गोऽ ए्यः गोऽह्इइम्यः गोऽ ह्यट्यः गोऽह्रम्यः गोभह्म्यः गोअह्र्द्यः गोसह्स्य्यः गोअङ्म्यः गबाह्भ्यः गबाद्ध्रम्यः गबाइस्य्यः गबाइ्य्यः |
| 5 गोइ घ्वर: गोबब्प्रः <br> गोअद्र: गोअब्प्रः <br> गबस्त्र: गवाब्दू: 6 | गोइह्ह्रम्याम्म् गोईए एय्याम्म्, <br> गोअळ्ञाल्याम्म्योअह्म्यान्म् <br>  |  <br>  गबाह्ड्र्याः गबाह्द्रेयः: गबाह्म्य्नः <br>  |
| ${ }^{6}$ same as above 6 | गोए घ्रो" गोइ क्झ्रोः गोऽ ब्ब्रो": गोअस्रोः गोसब्झ्रोः गोसब्झ्बो! <br>  |  गोअश्राम्यू गोअध्राम् गोसब्द्धाम्प् <br>  |
|  <br>  <br>  | गोए घ्रो" गो5 ब्ब्रोः गोए क्ब्रो": <br> गोअद्रोःः गोसब्झ्रोः गोअब्झ्बोः <br> गबाश्रो! गबाइद्बोः गबान्द्रो"ः 9 |  <br>  <br>  |
|  <br>  <br>  <br>  |  |  |


[^0]:    ${ }^{1}$ These phonemes are- all the stops including the nasals, semi vowels( $\mathrm{y}, \mathrm{r}, \mathrm{l}, \mathrm{v}$ ) and sibilants except h .

[^1]:    ${ }^{2}$ VyākaraëaMahābhāsya of Patañjali, 2001, Vol.1, p 130.
    ${ }^{3}$ More recently, Kiparsky in a forthcoming article available on his webpage, has discussed it.

[^2]:    ${ }^{4}$ This statement means that khay is reduplicated if it occurs after sar and sar is reduplicated if it occurs after khay. sar stands for all the sibilants except h and khay stands for all the voiceless stops.

[^3]:    ${ }^{5}$ PrakriyāKaumud̄̄, 2000, Vol.I, p 158.

[^4]:    ${ }^{6}$ I have to turn to Devnagari fonts for these two case to stress the amount of problem.
    ${ }^{7}$ The term ayogavāha refers to anusvāra, visarga, jihvāmulīya and upadhmān̄̄̀ya, Vy $\backslash=$ akaraëaMahābhāṣya of Patañjali, 2001, Vol.1, p 132.

[^5]:    ${ }^{8}$ cayo dvitīyā śari pauṣkarasādeḥ / on 8.4.48

