4. CLASSIFICATION OF GENOTYPES - COMBINED YEARS

For each combined-years data set the classification of genotypes is considered by:

(i) examining the dendogram illustrating the classification of genotypes

(ii) examining the scatter diagram of the first two vectors of the principal component analysis.

(iii) analyzing the contribution of ge effects to the classification of genotypes at each fusion level (Appendix I).

4.1 74/75 - 77/78 genotypes

Classification of genotypes is related to genetical origin of genotypes.

cr74, cr79, and gl06 are related genotypes

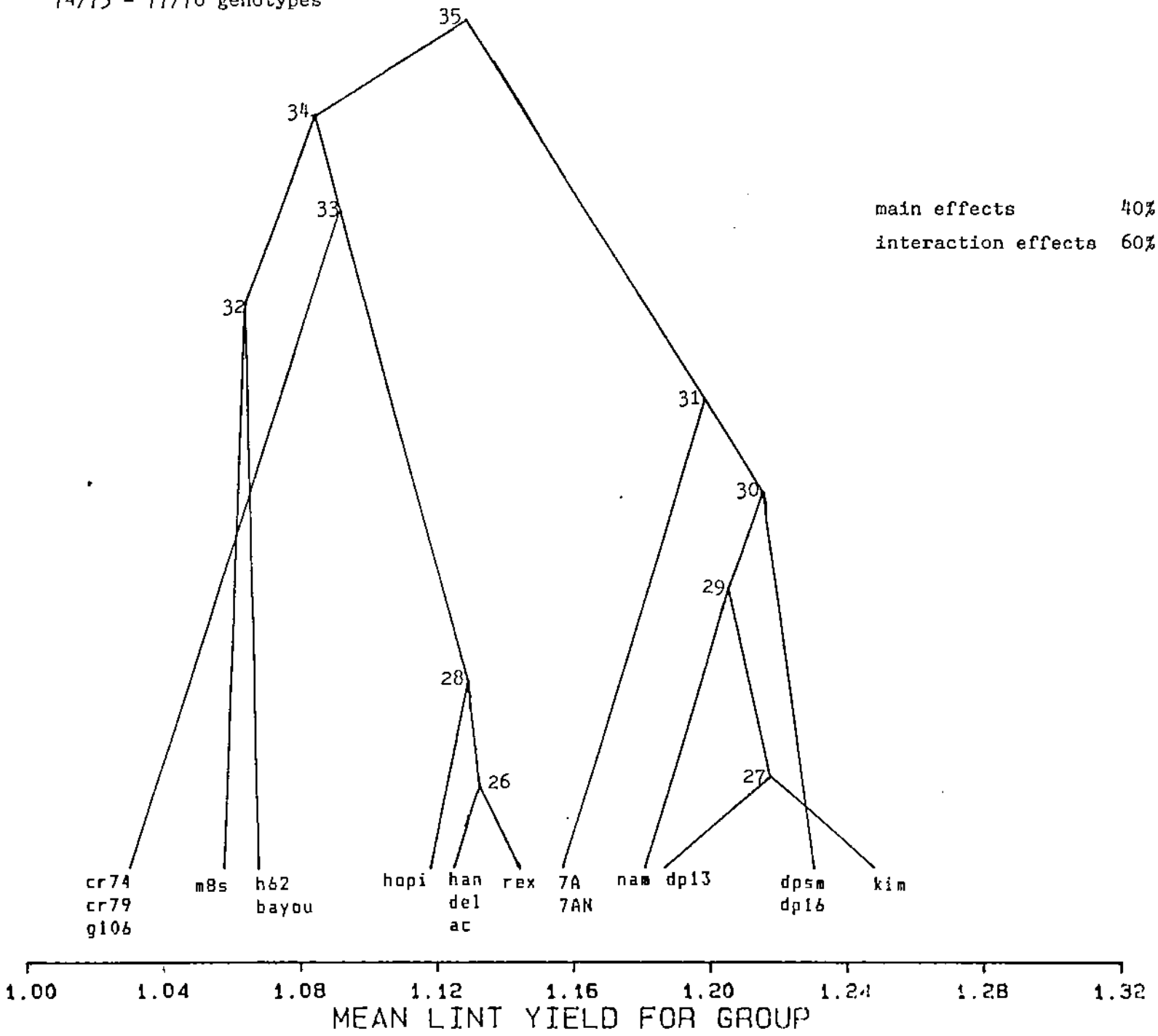
stoneville 7A and stoneville 7AN are closely related genetically

deltapine sm and deltapine 16 are closely related

group 28 - acala related genotypes

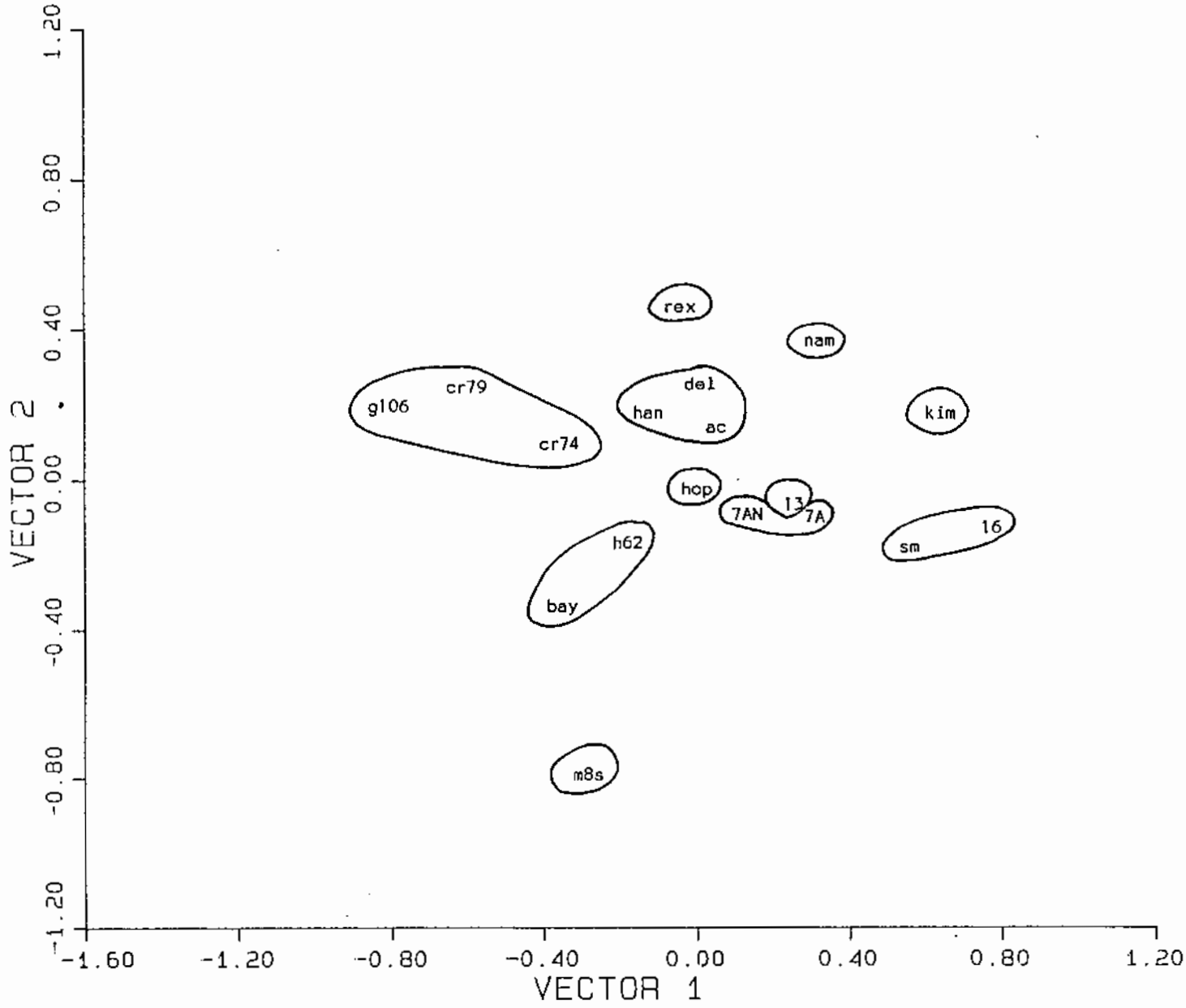
group 31 - recently developed varieties
- high yielding genotypes

Genotype-environment effects (60%) are important in separating genotype groups.


74/75 - 77/78 genotypes
35
34
33
32
31
30
29
28
27
26
main effects 40%
interaction effects 60%
cr74
cr79
g106
m8s
h62
bayou
hopi
han
del
ac
rex
7A
7AN
nam
dp13
dpsm
dp16
kim
1.00
1.04
1.08
1.12
1.16
1.20
1.24
1.28
1.32
MEAN LINT YIELD FOR GROUP

74 TO 77 LINT YIELD GENOTYPE ORDINATION

variation accounted by two vectors 64%



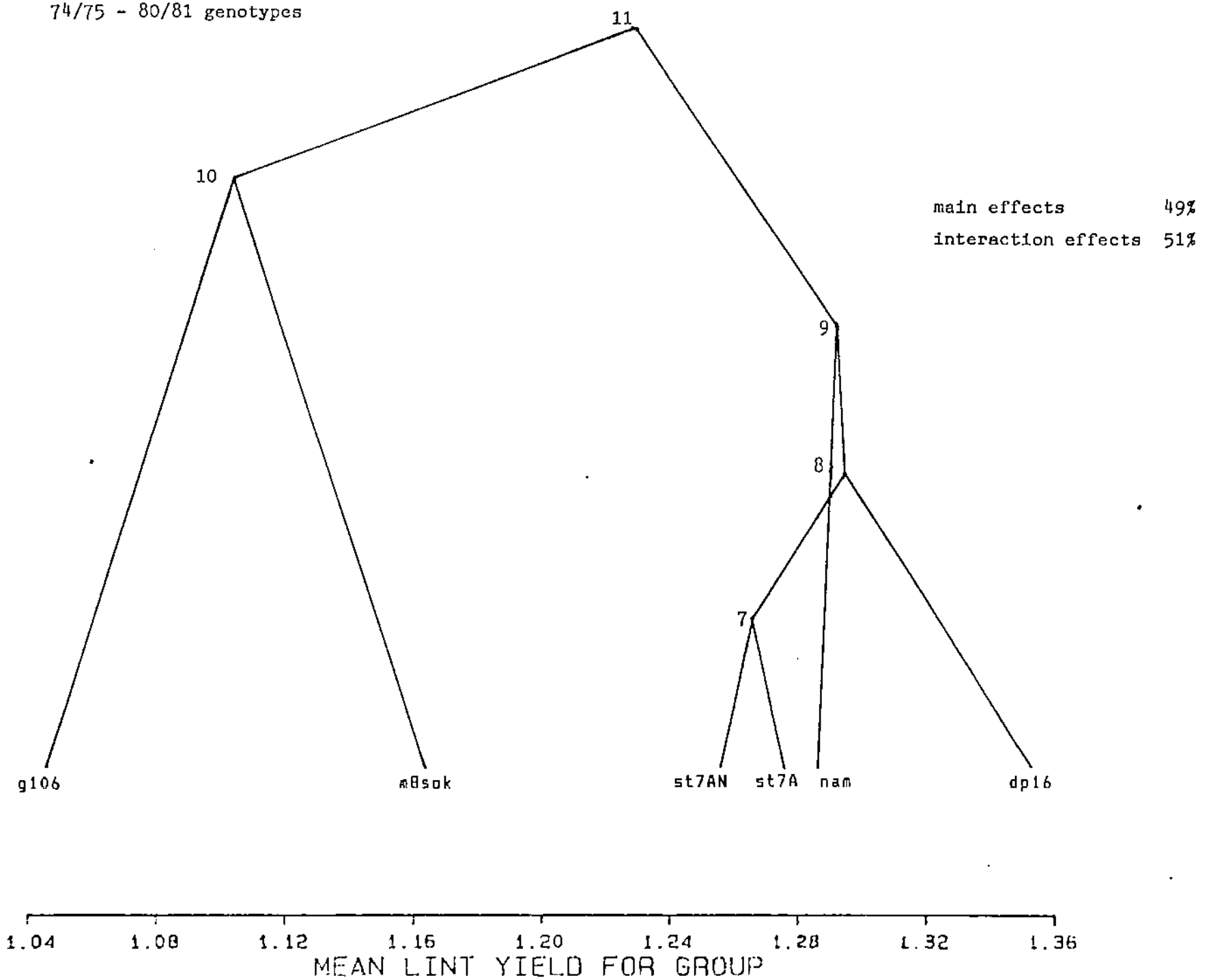
4.2 74/75 - 80/81 genotypes

Classification of genotypes is related to genetical origin of genotypes.

group 7 - stoneville 7A related genotypes

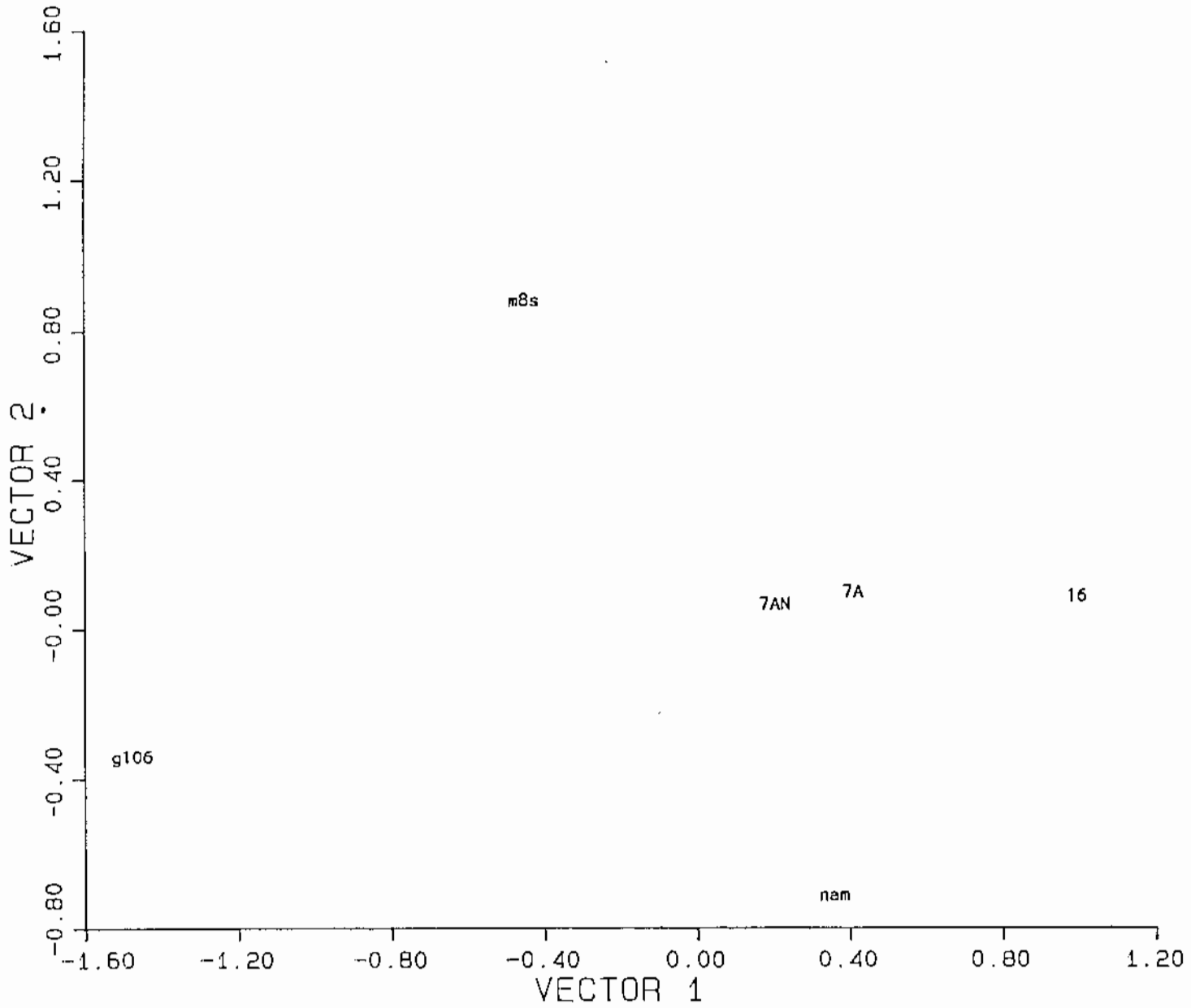
group 9 - stoneville-deltapine related improved cultivars.
- stoneville and deltapine are related genetically
- recently developed varieties
- high yielding varieties

Genotype-environment effects (51%) are important in separating genotype groups.


74/75 - 80/81 genotypes
11
10
9
8
7
main effects 49%
interaction effects 51%
g106
m8sok
st7AN
st7A
nam
dp16
1.04
1.08
1.12
1.16
1.20
1.24
1.28
1.32
1.36
MEAN LINT YIELD FOR GROUP

74 TO 80 LINT YIELD GENOTYPE ORDINATION

variation accounted by two vectors 85%



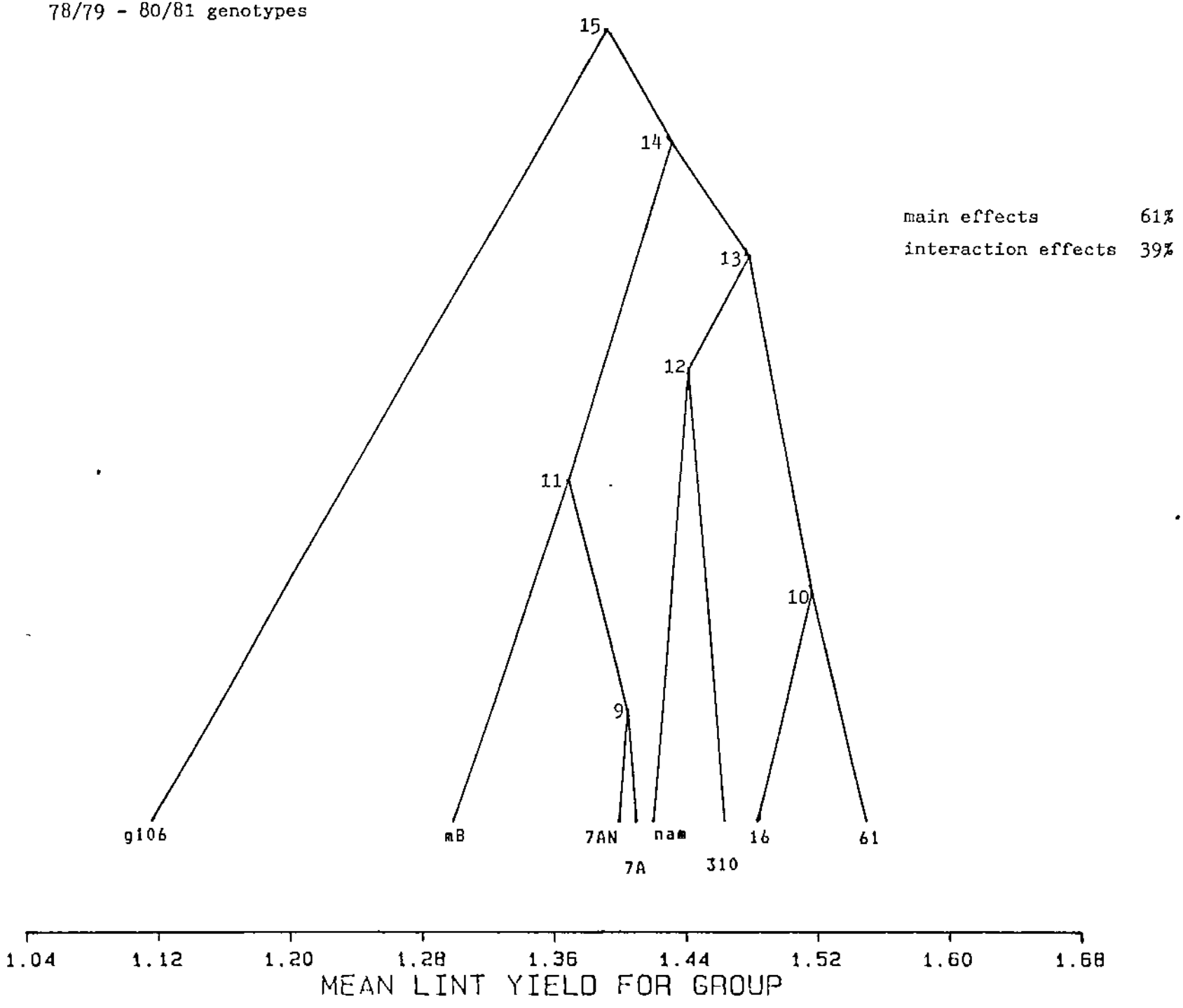
4.3 78/79 - 80/81 genotypes

Classification of genotypes is related to genetical origin of genotypes.

group 9 - stoneville 7A related genotypes

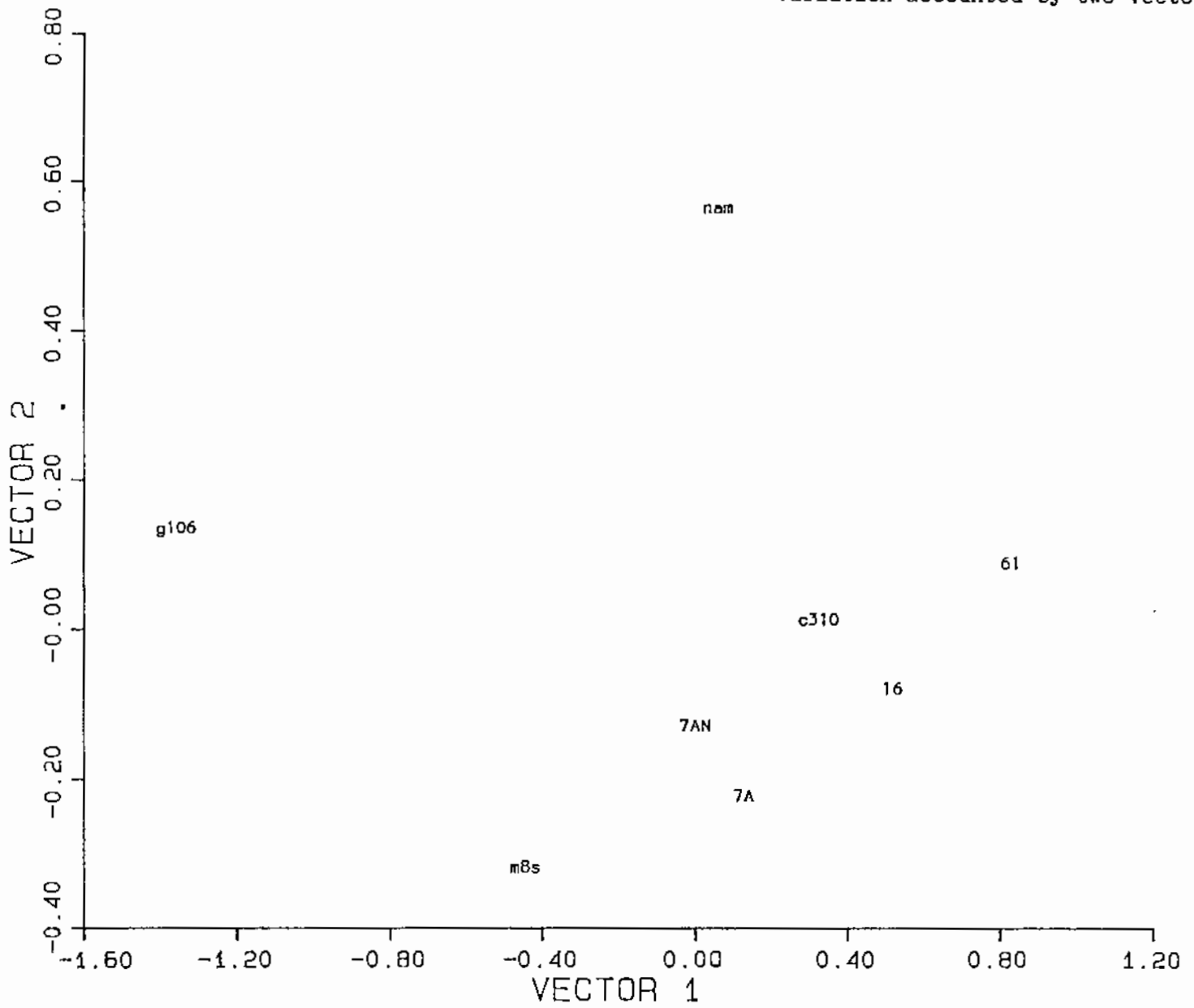
group 10 - Deltapine 16 and deltapine 61 are closely related.

Genotype-environment effects (39%) are significant in separating genotype groups.


78/79 - 80/81 genotypes
15
14
13
12
11
10
9
main effects 61%
interaction effects 39%
g106
mB
7AN
7A
nam
310
16
61
1.04
1.12
1.20
1.28
1.36
1.44
1.52
1.60
1.68
MEAN LINT YIELD FOR GROUP

78 TO 80 LINT YIELD GENOTYPE ORDINATION

variation accounted by two vectors 82%



4.4 80/81 - 84/85 genotypes

Classification of genotypes is related to genetical origin of genotypes.

group 9 - sicot 1 and sicot 2 are selections from the same cross

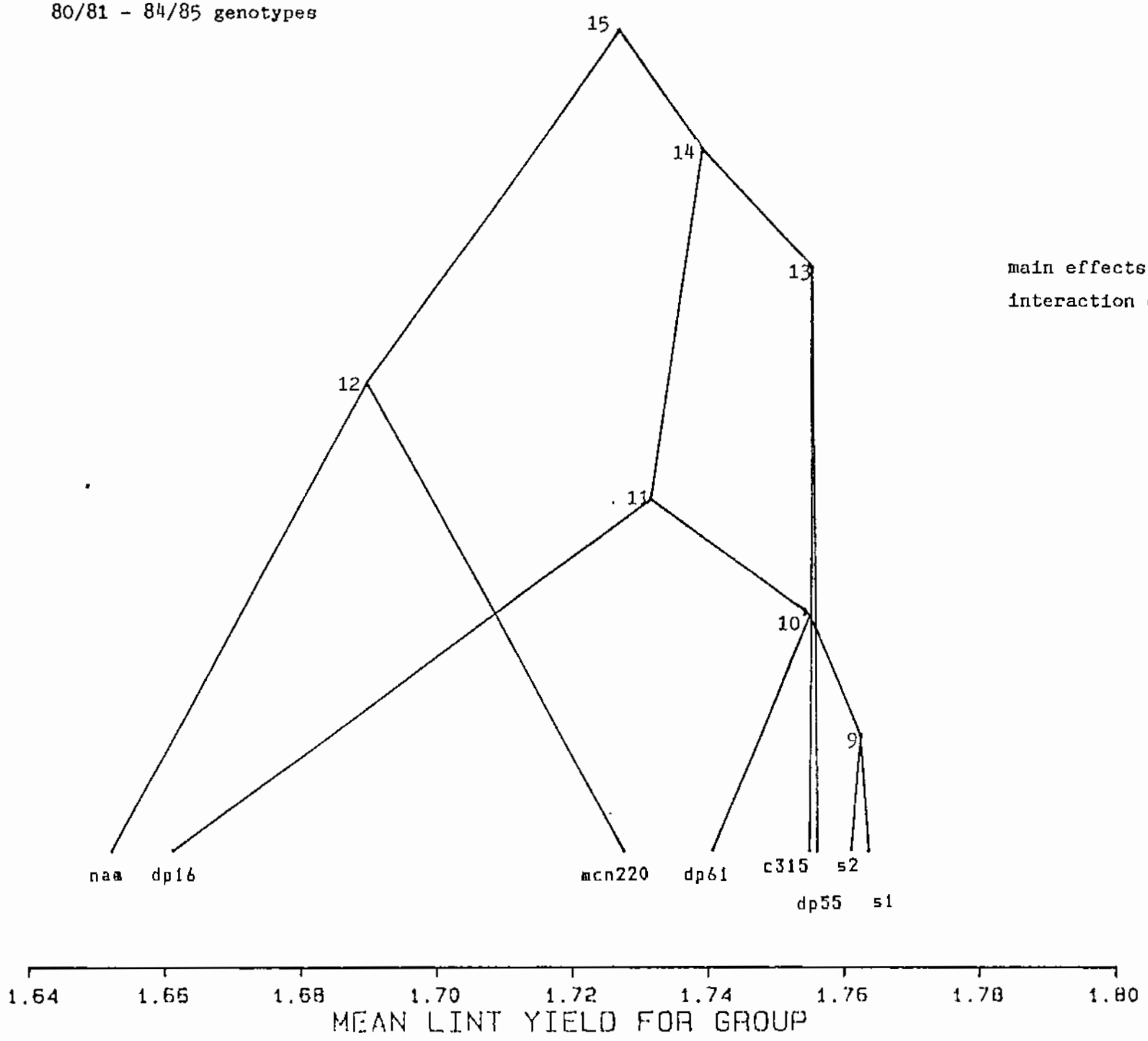
group 10 - deltapine 61 is a parent of sicot 1 and sicot 2.

group 11 - Deltapine 16 is a sister selection to deltapine 16.

group 14 - Deltapine related genotypes.

Genotype-environment effects (89%) are important in classifying genotypes. The genotype pattern of response over environments overrides the average yield differences between genotypes.

80/81 - 84/85 genotypes

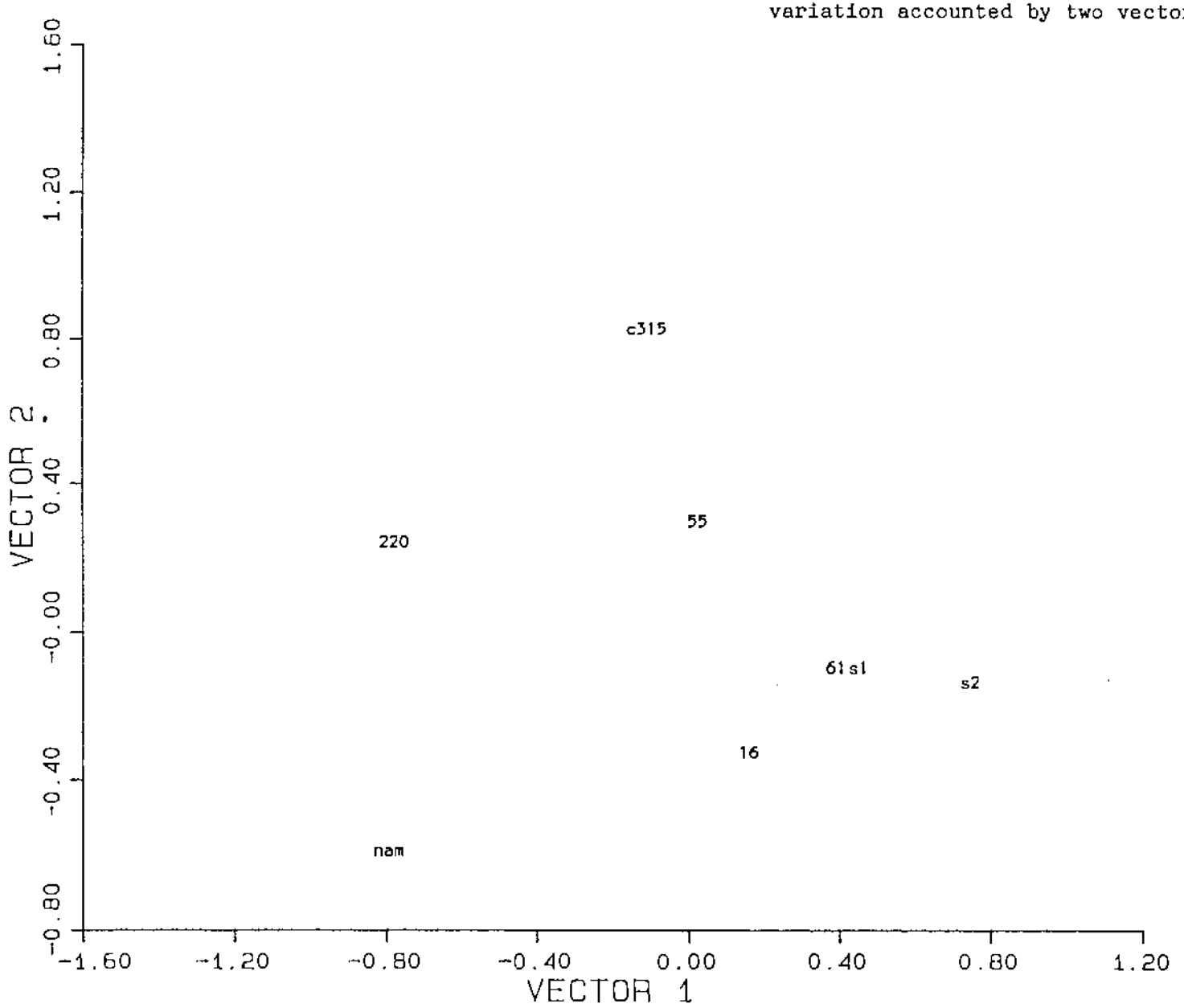


main effects 11%

interaction effects 89%

80 TO 84 LINT YIELD GENOTYPE ORDINATION

variation accounted by two vectors 61%



4.5 80/81 - 85/86 genotypes

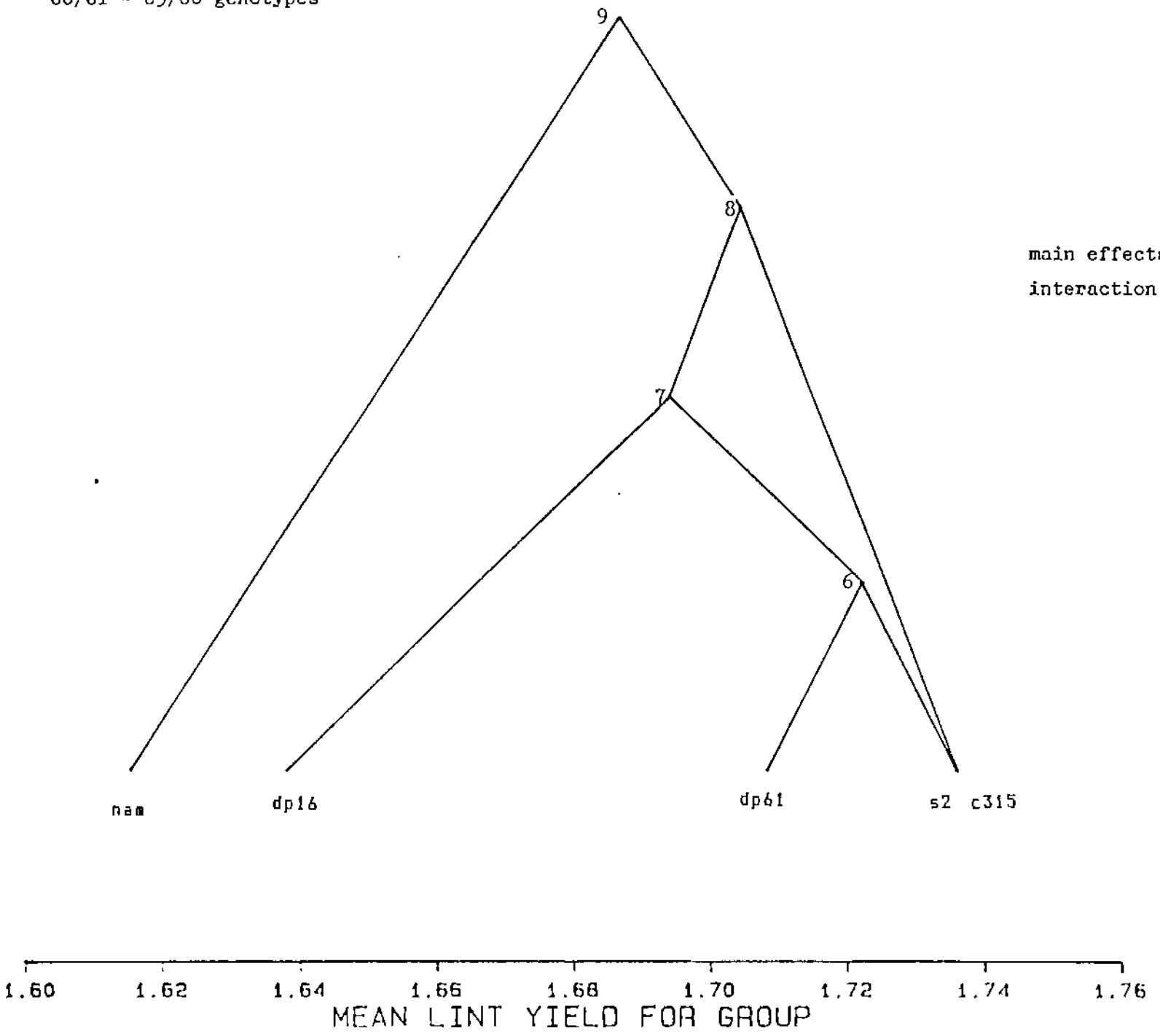
Classification of genotypes is related to genetical origin of genotypes.

group 6 - deltapine 61 is a parent of sicot 2.

group 7 - Deltapine 16 related genotypes.

The pattern of response over environments or the genotype-environment effects (83%) are more important in grouping genotypes than the genotype mean yields (17%).

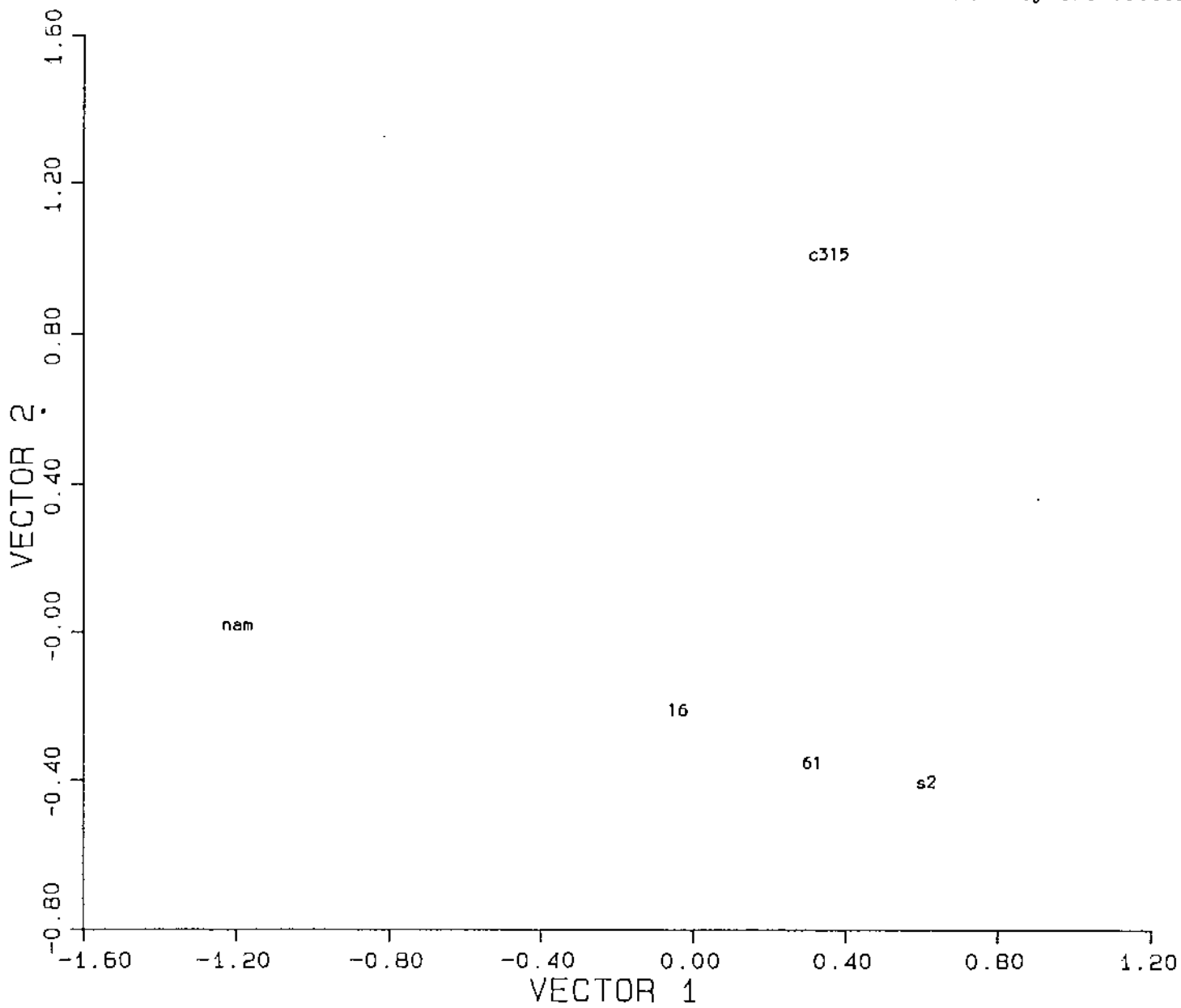
80/81 - 85/86 genotypes



main effects	17%
interaction effects	83%

80 TO 85 LINT YIELD GENOTYPE ORDINATION

variation accounted by two vectors 79%



4.6 81/82 - 84/85 genotypes

Classification of genotypes is related to genetical origin of genotype.

group 12 - Deltapine 41 and deltapine 55 are closely related

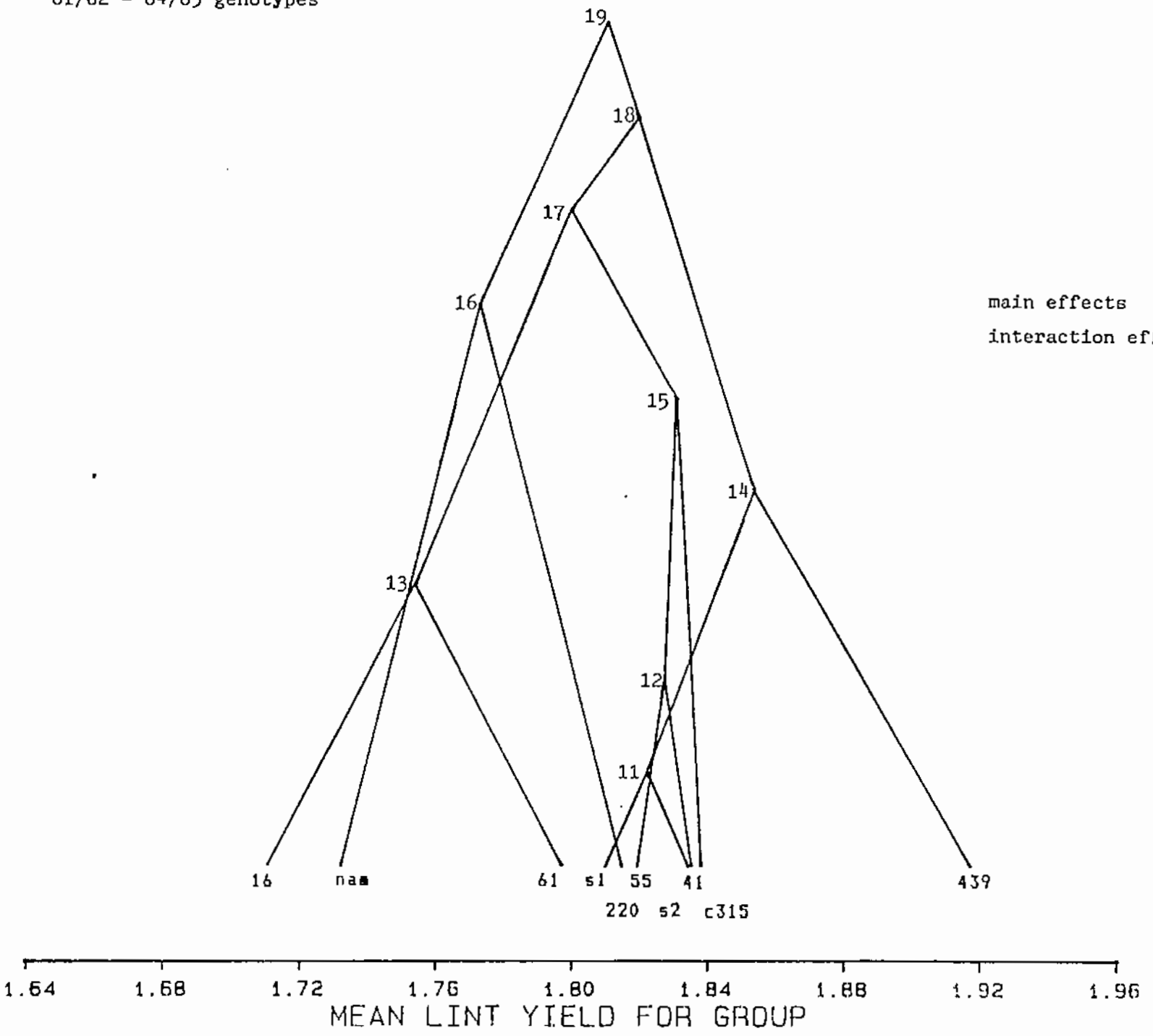
group 13 - Deltapine 16 and deltapine 61 are closely related

group 14 - CSIRO selections from the same cross

group 18 - Deltapine related genotypes.

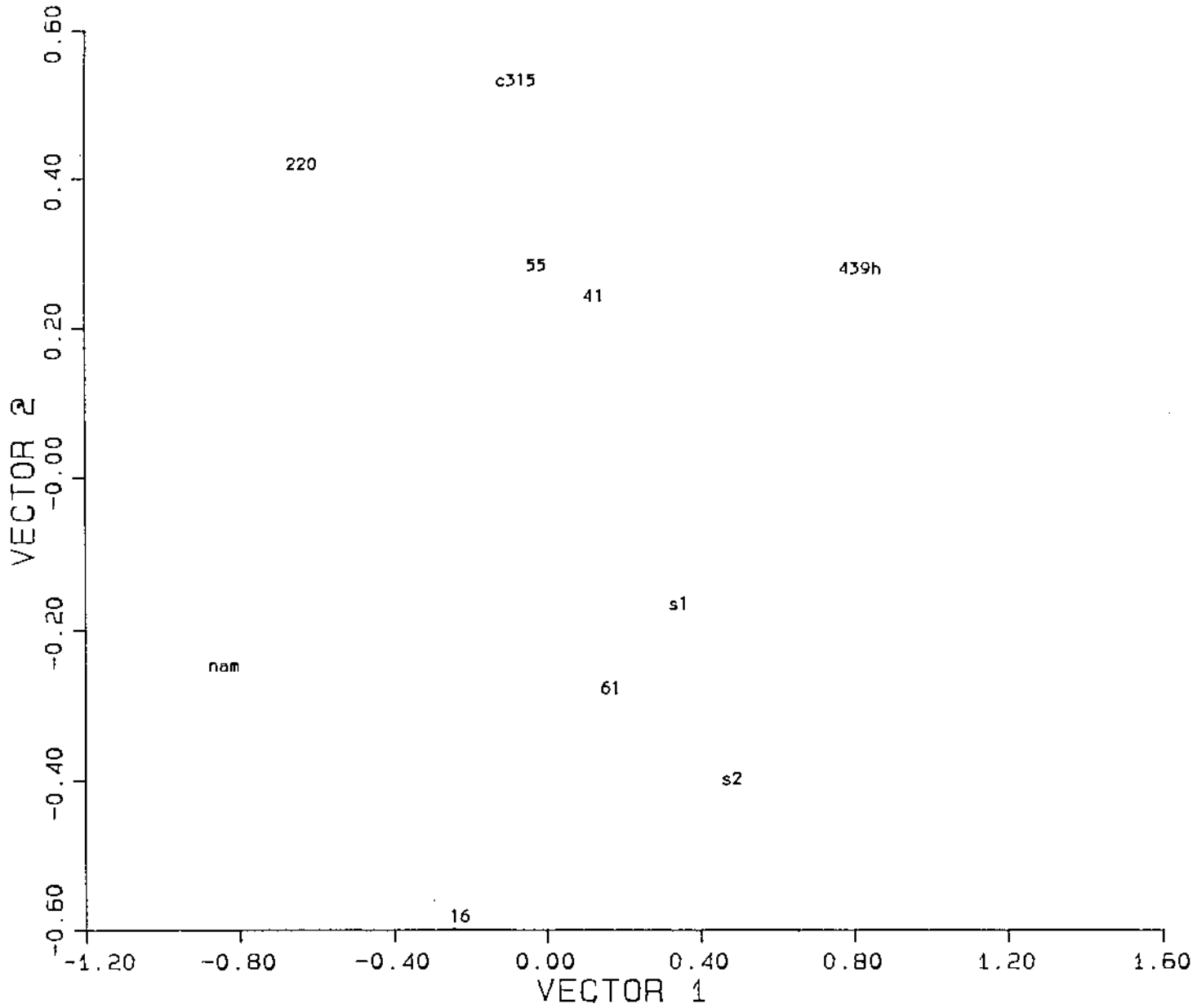
Genotype-environment effects (82%) are important in classifying genotypes into groups. Again the pattern of response overrides the genotype main effects.

81/82 - 84/85 genotypes



81 TO 84 LINT YIELD GENOTYPE ORDINATION

variation accounted by two vectors 58%



4.7 82/83 - 84/85 genotypes

Classification of genotypes is related to genetical origin of genotypes.

group 17 - CSIRO selections from the same cross

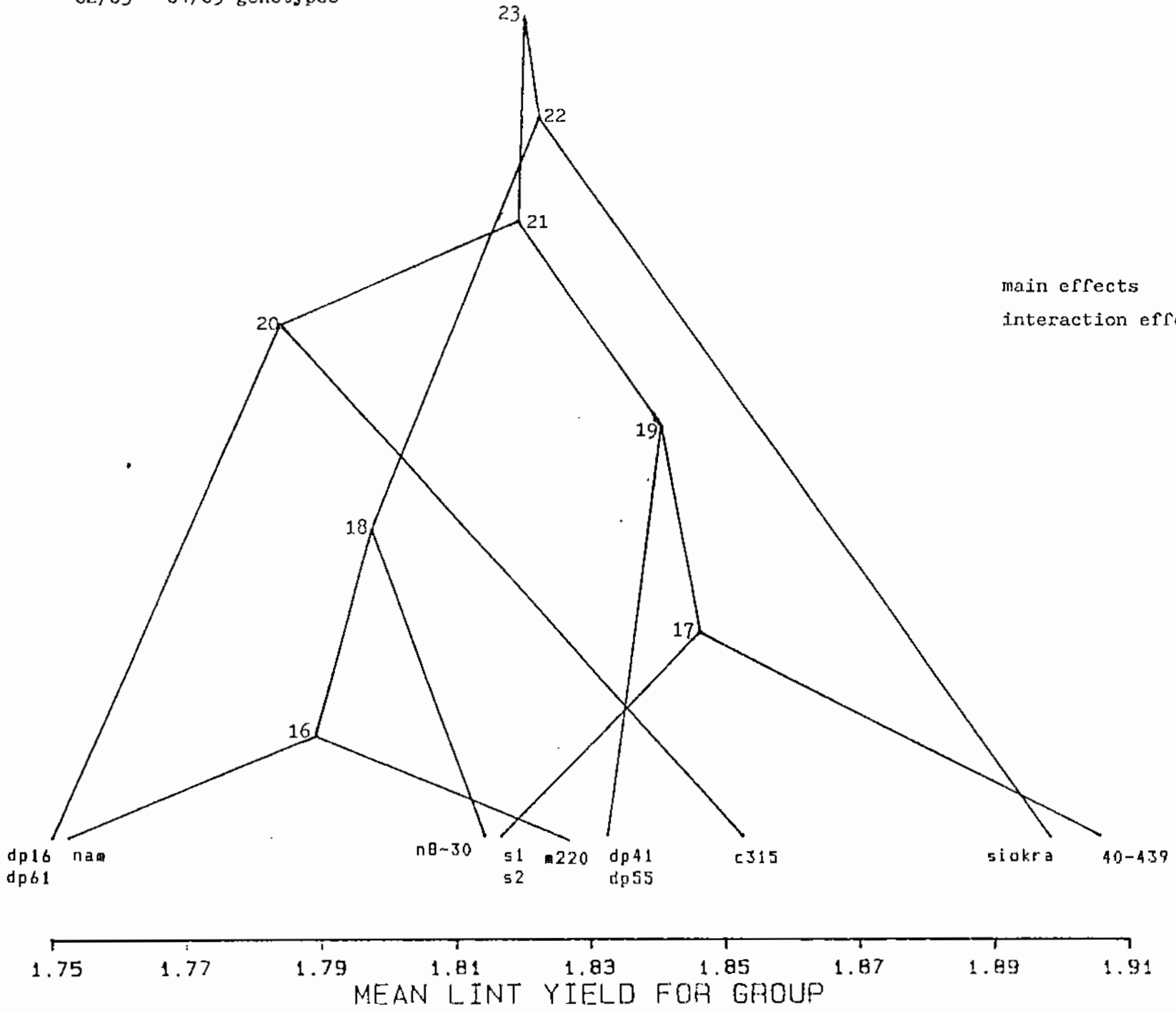
group 18 - n8-30 is a selection from namcala

group 21 - Deltapine related genotypes

group 22 - early maturity cultivars which are related to Namcala.

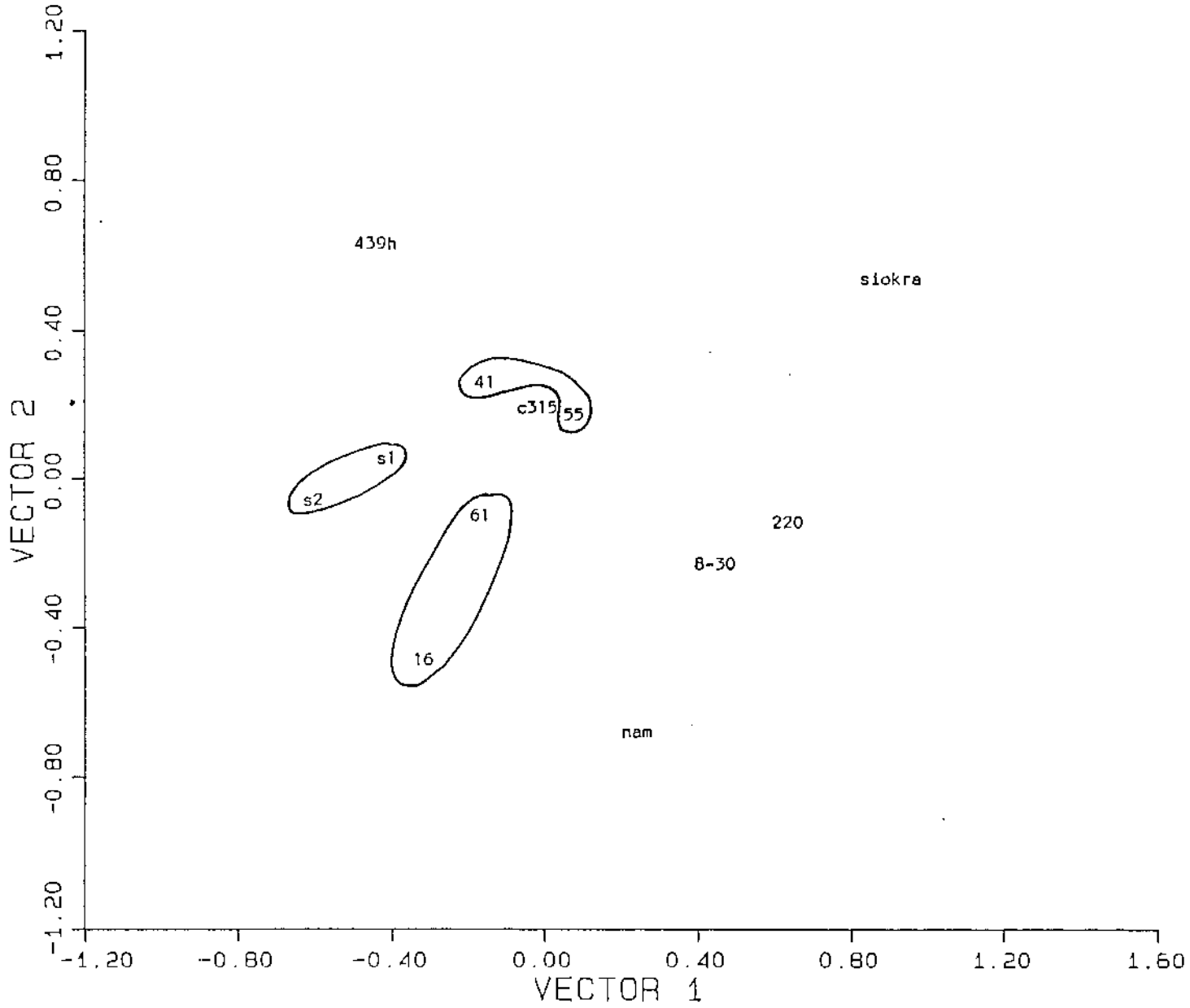
Genotype-environment effects (86%) are important in separating genotype groups.

82/83 - 84/85 genotypes



82 TO 84 LINT YIELD GENOTYPE ORDINATION

variation accounted by two vectors 57%



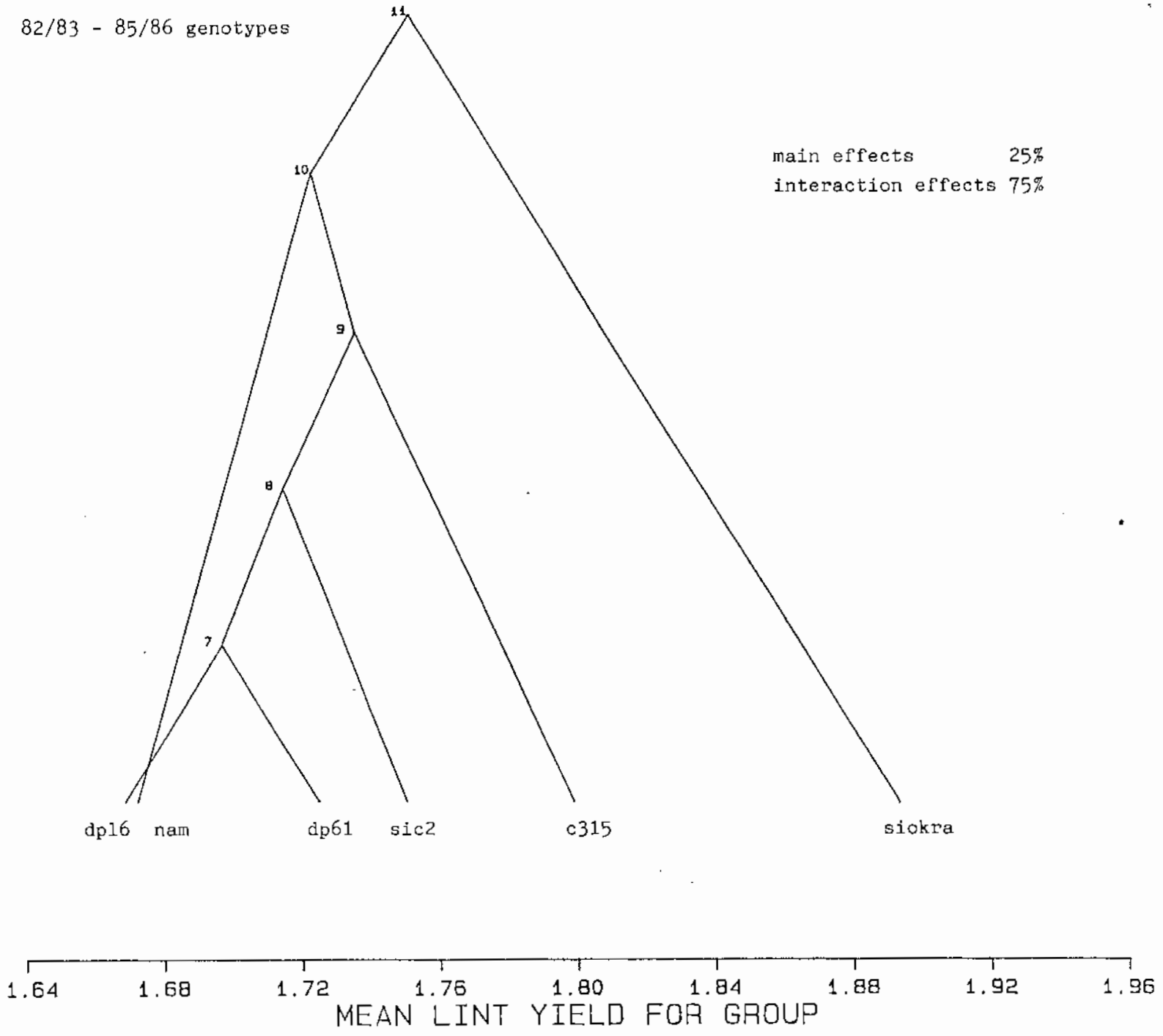
4.8 82/83 - 85/86 genotypes

Classification of genotypes is related to genetical origin of genotypes.

group 7 - Deltapine 16 and deltapine 61 are closely related

group 8 - Deltapine 16 is the parent of these three genotypes

Genotype-environment effects (72%) are important in classifying genotypes into groups.

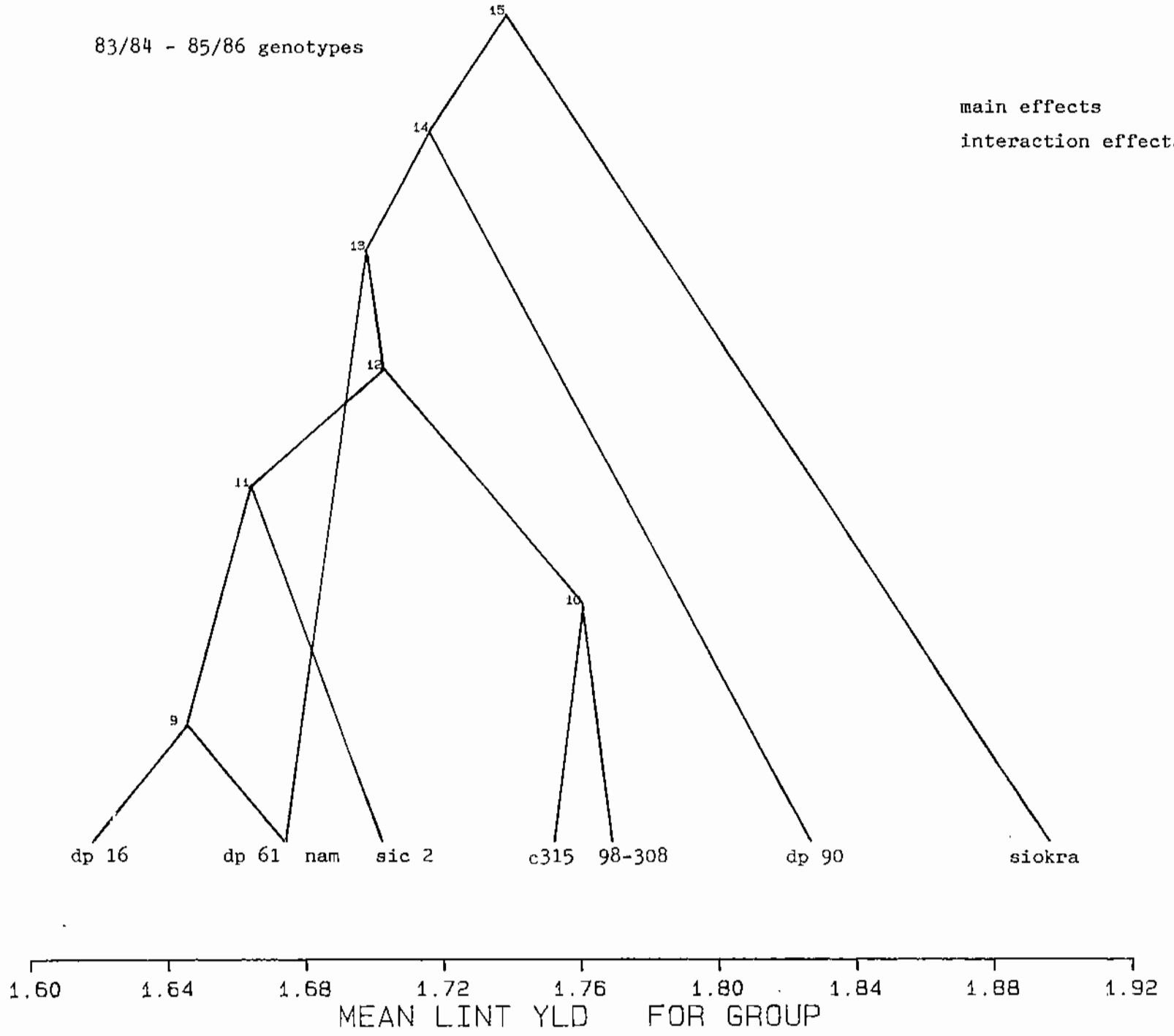

82/83 - 85/86 genotypes
11
10
9
8
7
main effects 25%
interaction effects 75%
dp16
nam
dp61
sic2
c315
siokra
1.64
1.68
1.72
1.76
1.80
1.84
1.88
1.92
1.96
MEAN LINT YIELD FOR GROUP

4.9 83/84 - 85/86 genotypes

Classification of genotypes is partly related to genetical origin of genotypes.

group 11 - three genotypes all related to deltapine 16

Genotype-environment effects (72%) are important in grouping genotypes.


83/84 - 85/86 genotypes
main effects 28%
interaction effects 72%
15
14
13
12
11
10
9
dp 16
dp 61
nam
sic 2
c315
98-308
dp 90
siokra
1.60
1.64
1.68
1.72
1.76
1.80
1.84
1.88
1.92
MEAN LINT YLD FOR GROUP

4.10 84/85 - 85/86 genotypes

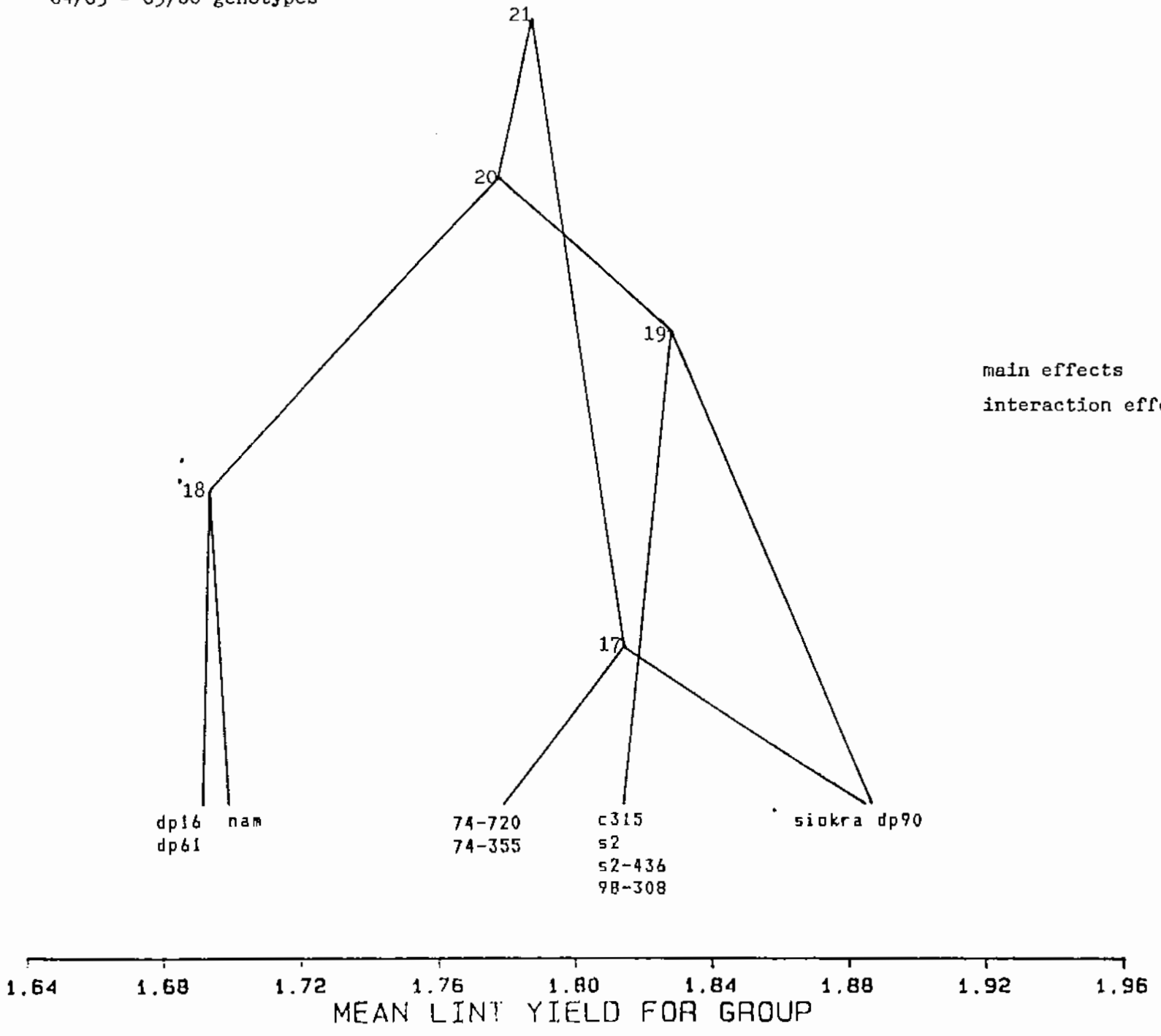
Classification of genotypes is related to genetical origin of genotypes.

group 17 - CSIRO selections from same cross
- early maturity genotypes

group 20 - Deltapine related genotypes
- later maturity cultivars.

Genotype-environment effects (76%) are important in classifying genotypes.

84/85 - 85/86 genotypes

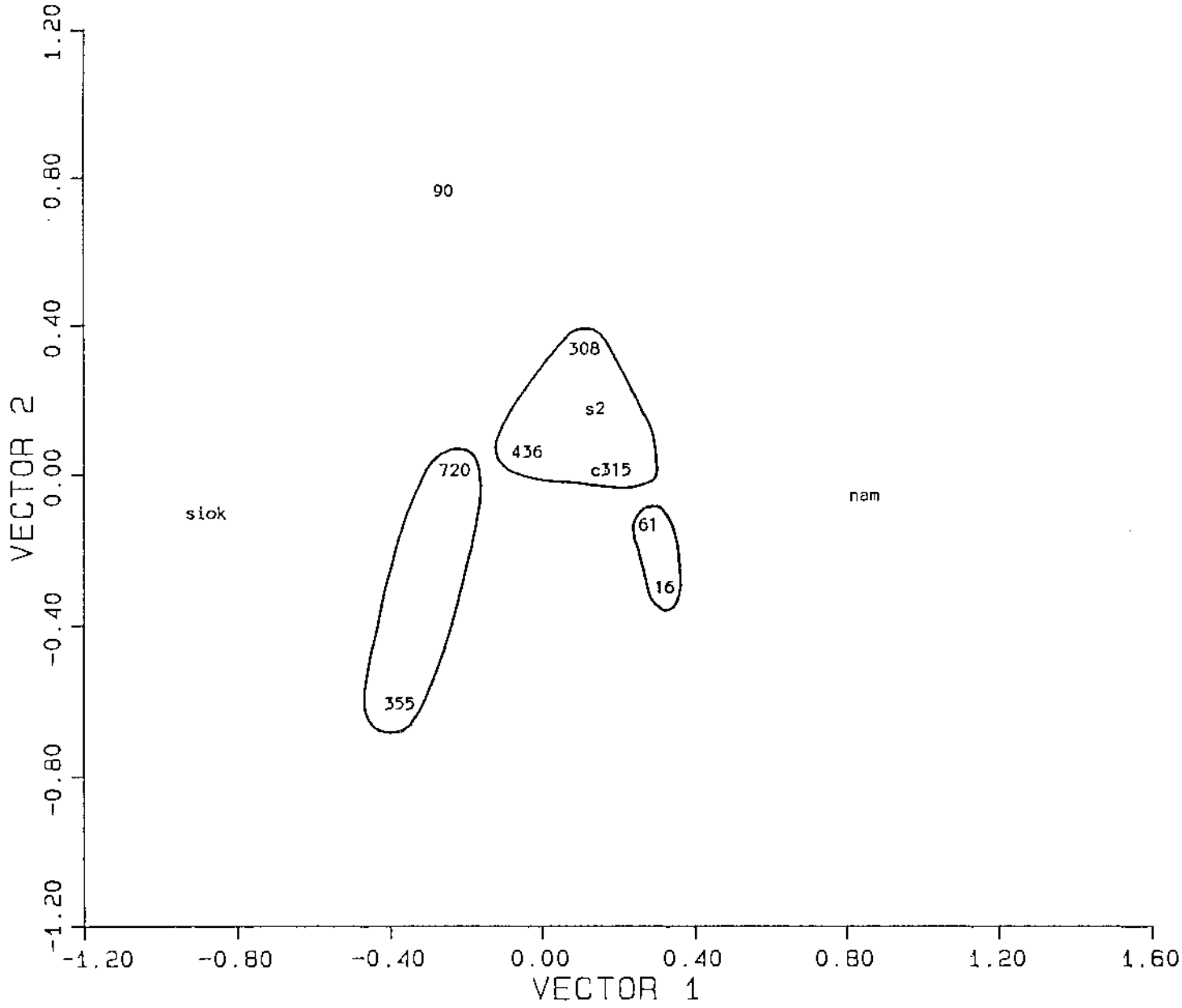


main effects 24%

interaction effects 76%

84 TO 85 LINT YIELD GENOTYPE ORDINATION

variation accounted by two vectors 60%



4.11 Summary

Classification of genotypes is definitely related to the genetical origin of the genotypes. This relationship is more clearly expressed in the combined-years data sets than is observed in the single-years data sets (section 3).

Classification of genotypes is mainly determined by genotype-environment interactions (average of 71%) and partly determined by genotype main effects (average of 29%). In contrast, genotype-environment effects contributed 41% to the classification of genotypes in the single-year data sets (section 3.13). Probably, this is because genotype-environment variation in comparison to genetic variation is larger for combined-year data sets than it is for single-year data sets (Appendix A).

This is clear evidence that for combined-years data sets, the pattern analysis is doing an excellent job in summarizing the genotype-environment interactions in a manner that can be easily interpreted by a plant breeder.

Table 4. Contribution of ge interaction effects (%) to genotype classification

year	ge contribution(%)
74-77	60
74-80	51
78-80	39
80-84	89
80-85	83
81-84	82
82-84	86
82-85	75
83-85	72
84-85	76
average	71

5. CLASSIFICATION of ENVIRONMENTS - SINGLE YEARS

For each single year data set, the classification of environments (locations) is considered by:

(i) examining the dendogram illustrating the classification of locations based on ge effects.

(ii) relating this classification to site mean yields (Fig. 5.0.1) and to geographical position (Fig. 5.0.2).

(iii) examining the scatter diagram of the first two vectors of the principal component analysis.

The classification and ordination of environments is done on ge effects and ignores the mean yield differences between them.

Figure 5.0.1 Location x year yields

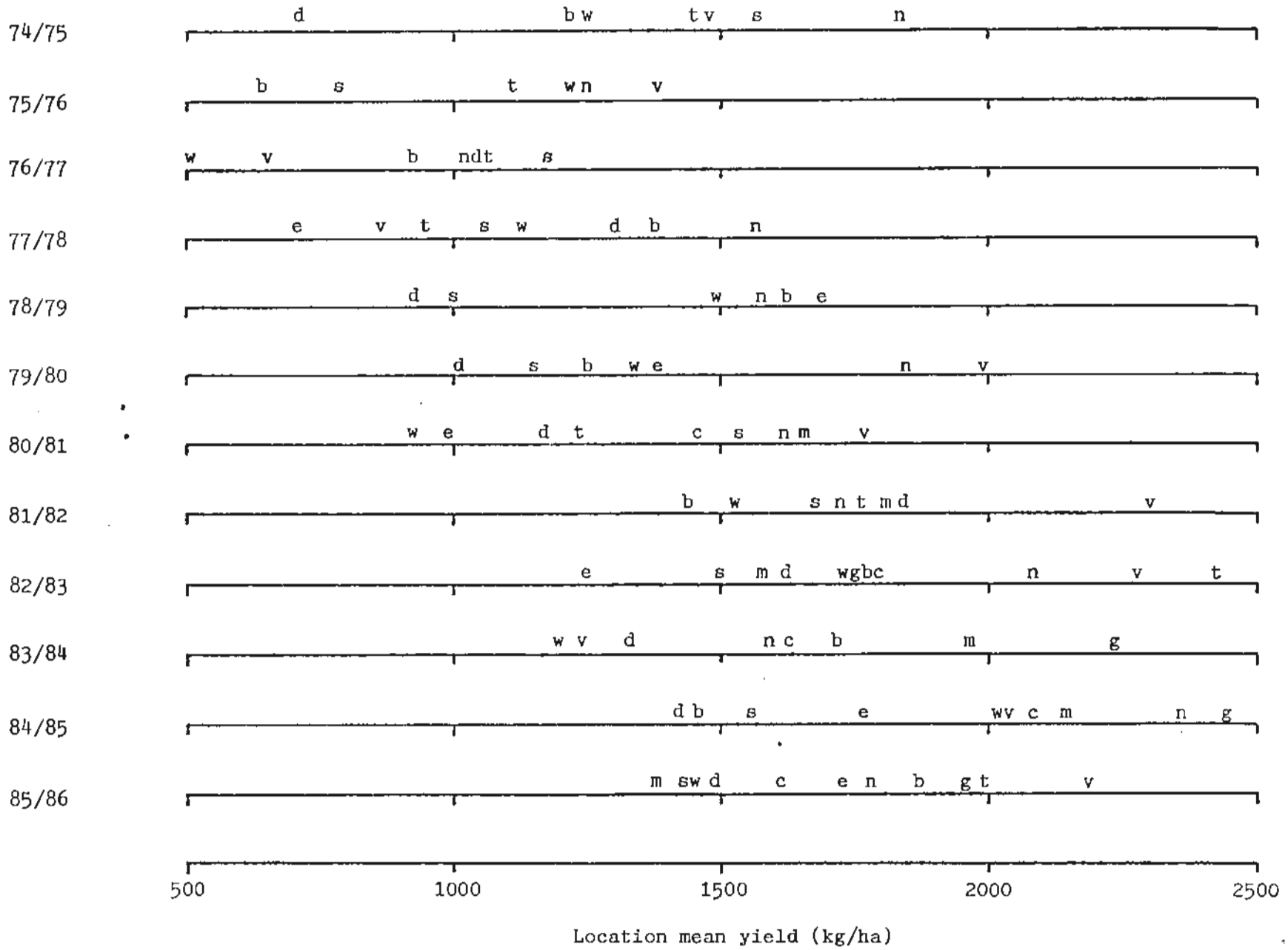
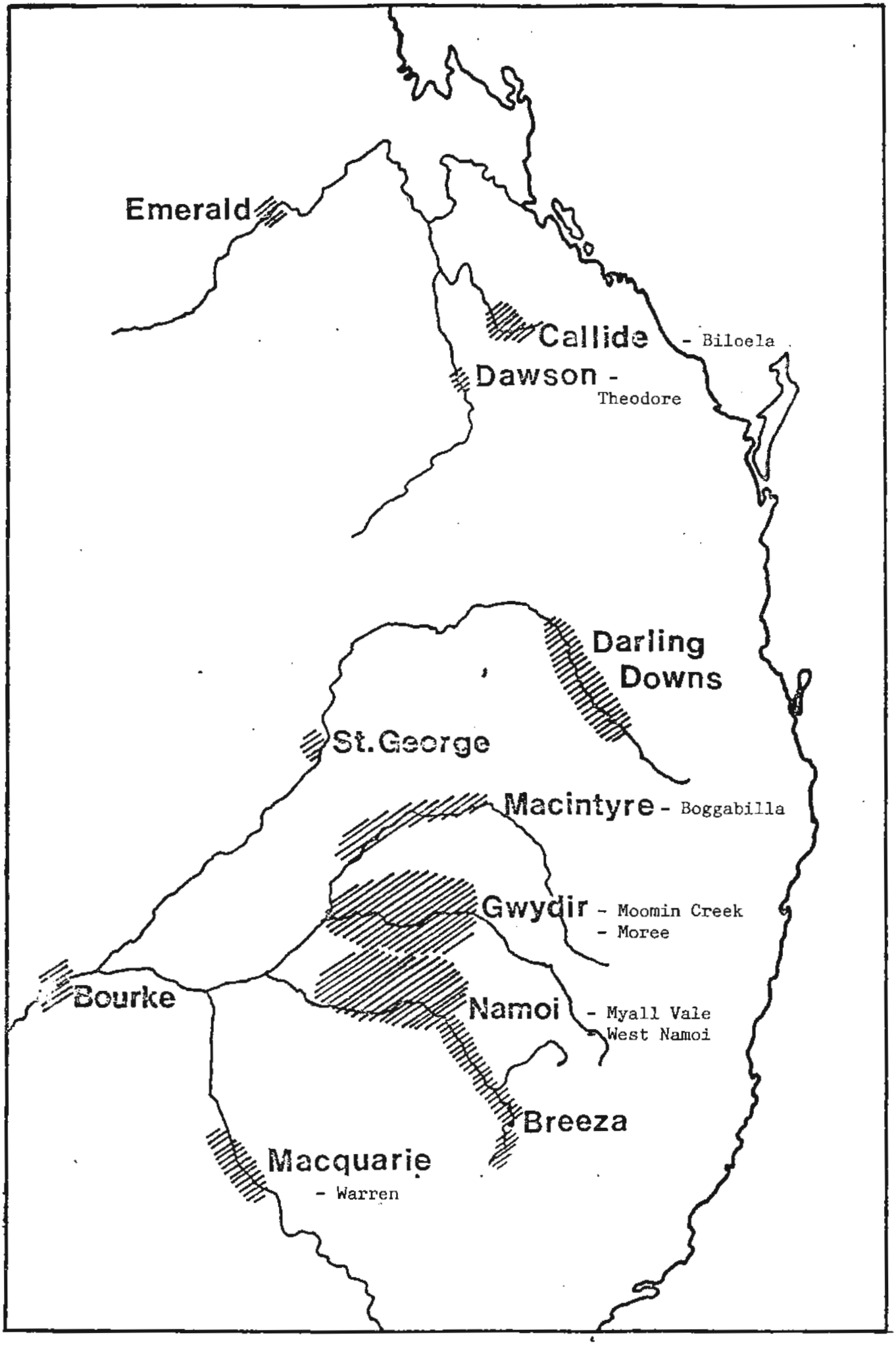


Figure 5.0.2 Location of trials

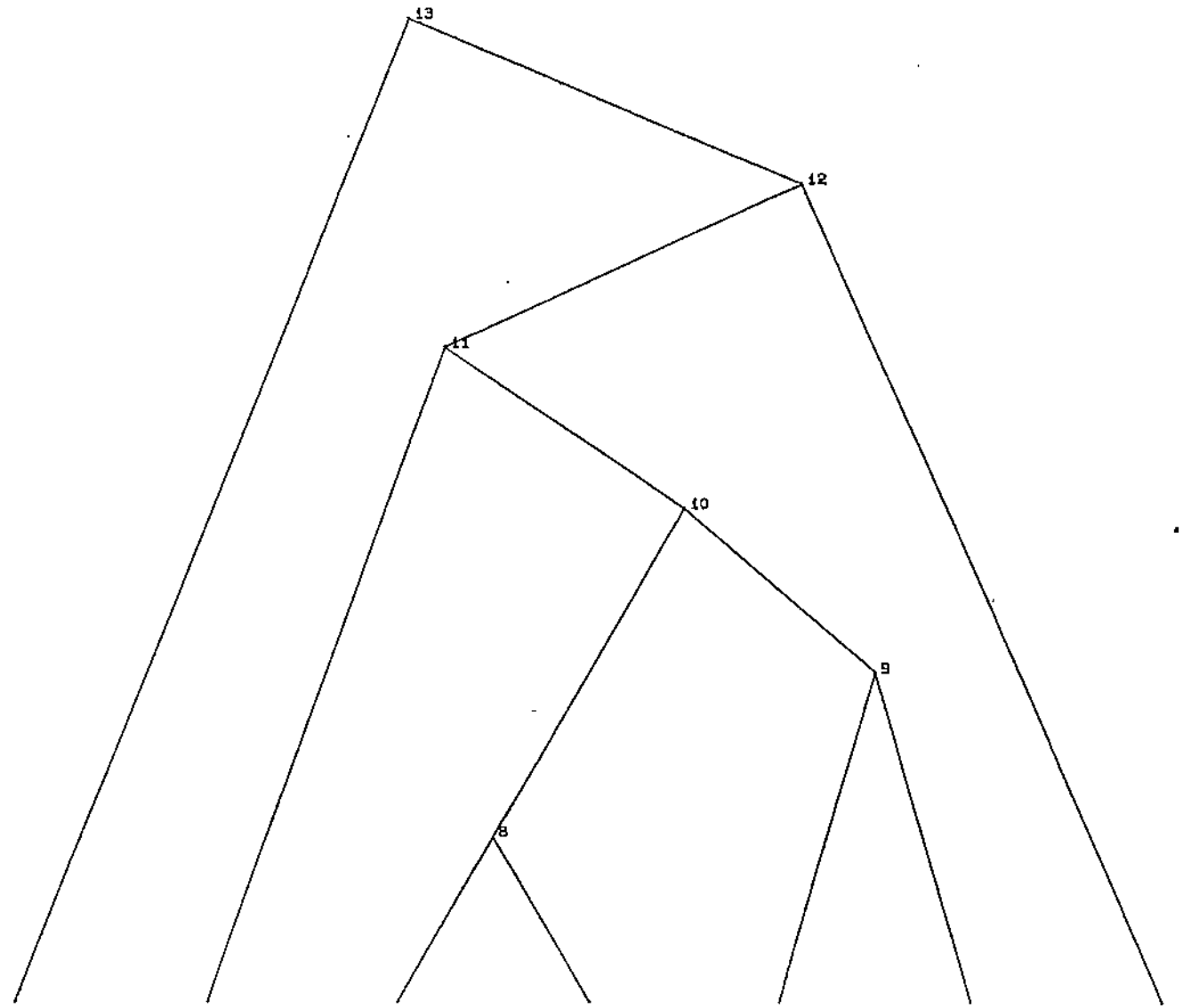


5.1 74/75 environments

Theodore and Myall vale (group 8) have similar means and similar ge.

Biloela ge is different from all other locations.

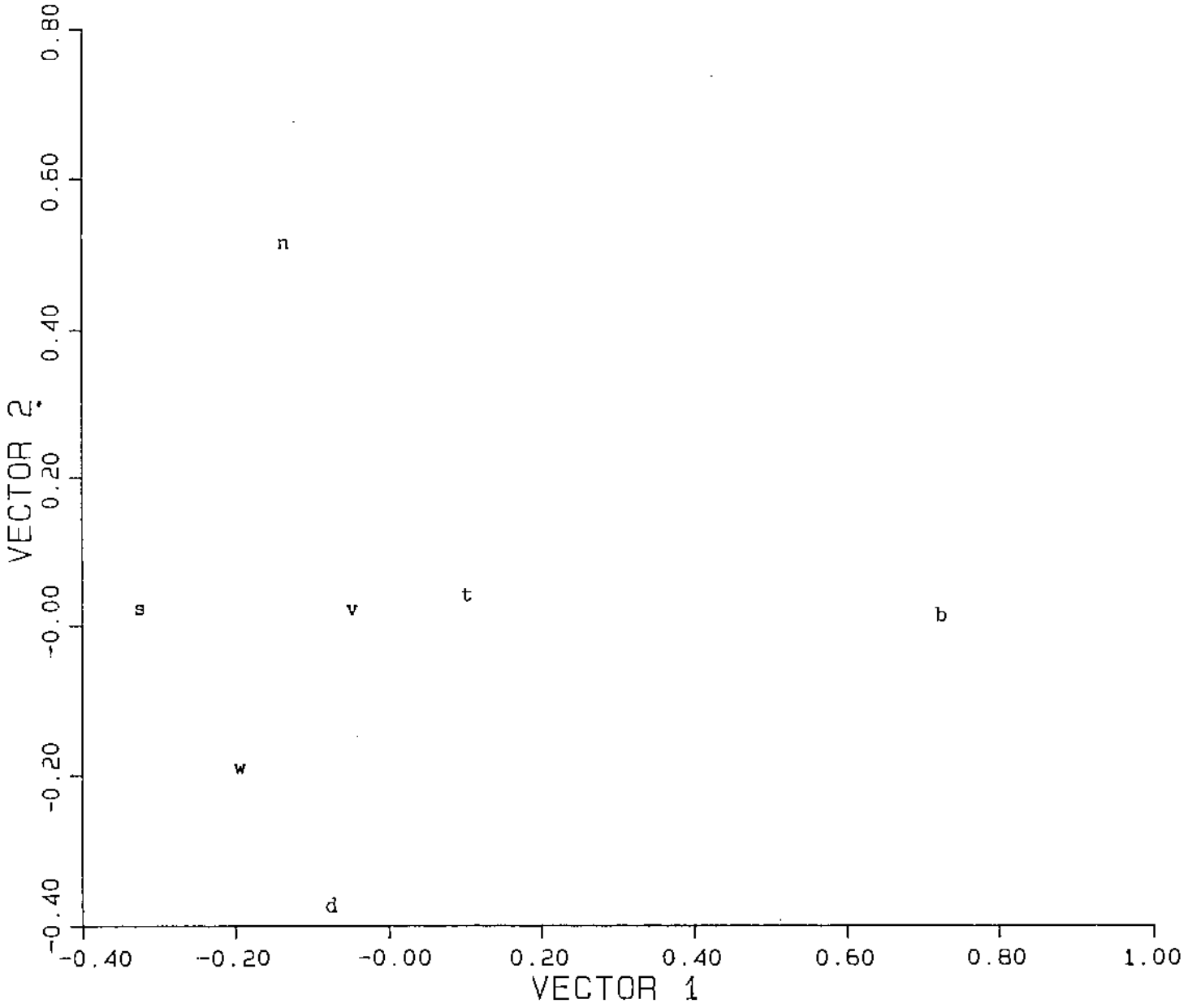
Grouping of environments is not related to geographical position or to site mean yield.



HIERARCHY FOR ENVIRONMENTS (GXE EFFECTS)

1974/75 LINT YLD(GE) ENVIRONMENT ORDINATION

ge accounted by two vectors 75%



5.2 75/76 environments

Biloela ge is different from other locations.

Considering the three group level

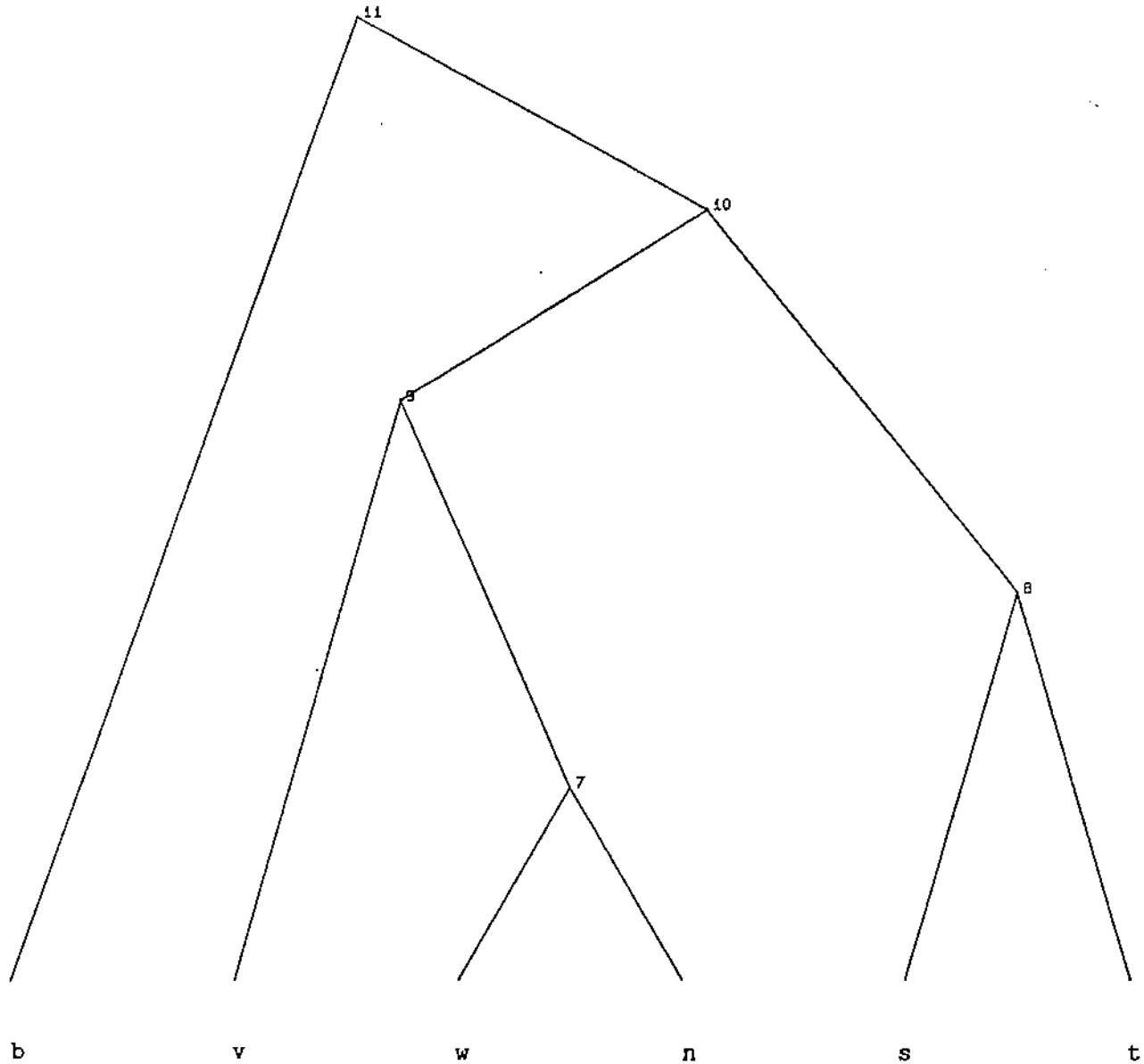
group b - Biloela

group 8 - two other Qld locations, excluding Biloela

group 9 - all three NSW locations from the Namoi and Macquarie regions which have similar site means and similar ge.

Grouping of environments is related to site mean yield which also corresponds to geographical position.

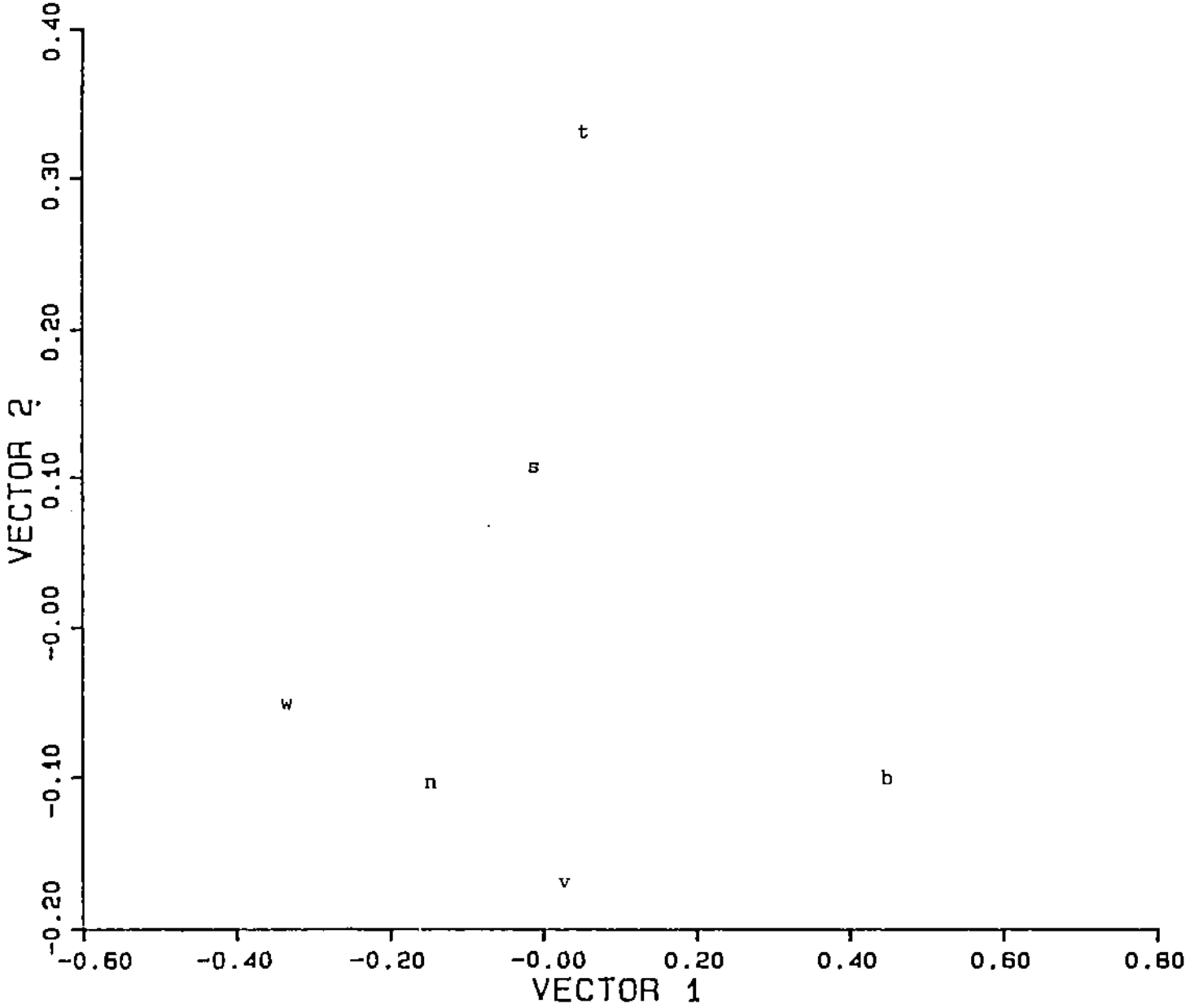
75/76 environments



HIERARCHY FOR ENVIRONMENTS (GXE EFFECTS)

1975/76 LINT YLD(GE) ENVIRONMENT ORDINATION

ge accounted by two vectors 70%



5.3 76/77 environments

Biloela ge is different from all other locations.

Considering the three group level :-

group b - Biloela

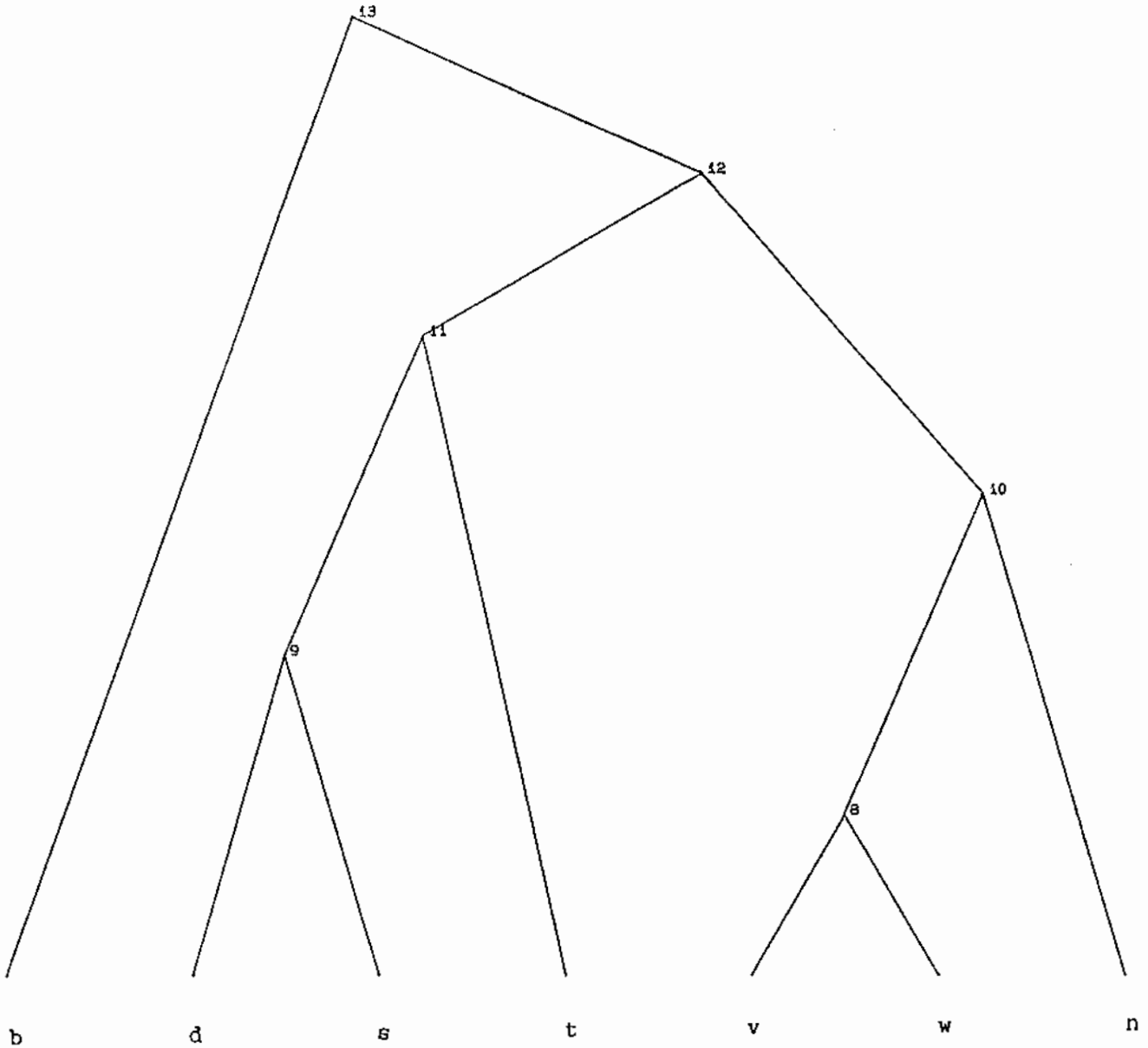
group 11 - three Qld locations, excluding Biloela, with high site mean yields and similar ge.

group 10 - all three NSW locations from Namoi and Macquarie regions.

Warren and Myall Vale (group 8) have low site mean yields and similar ge.

Grouping of environments is related to geographical position.

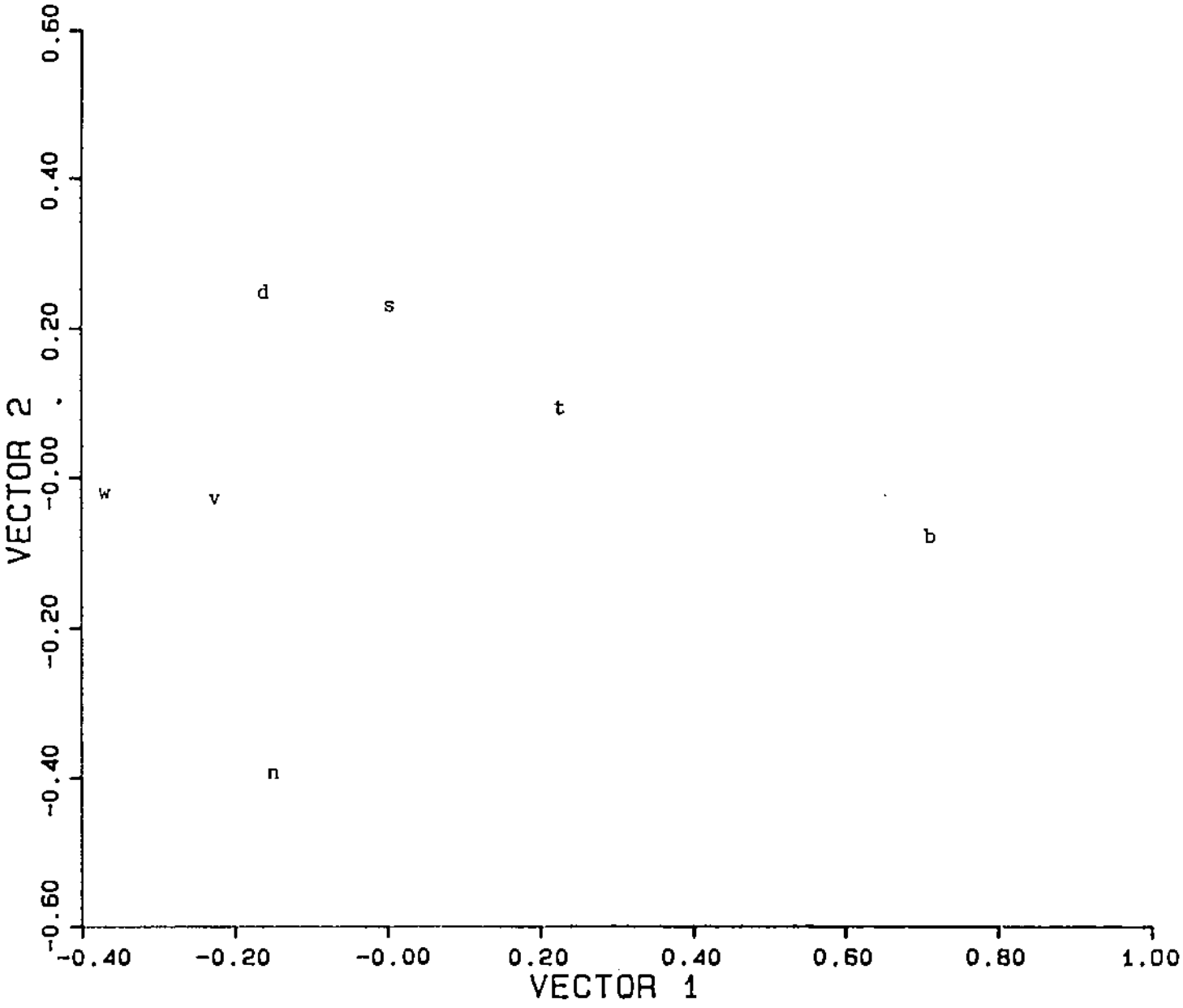
76/77 environments



HIERARCHY FOR ENVIRONMENTS (GXE EFFECTS)

1976/77 LINT YLD (GE) ENVIRONMENT ORDINATION

ge accounted by two vectors 73%



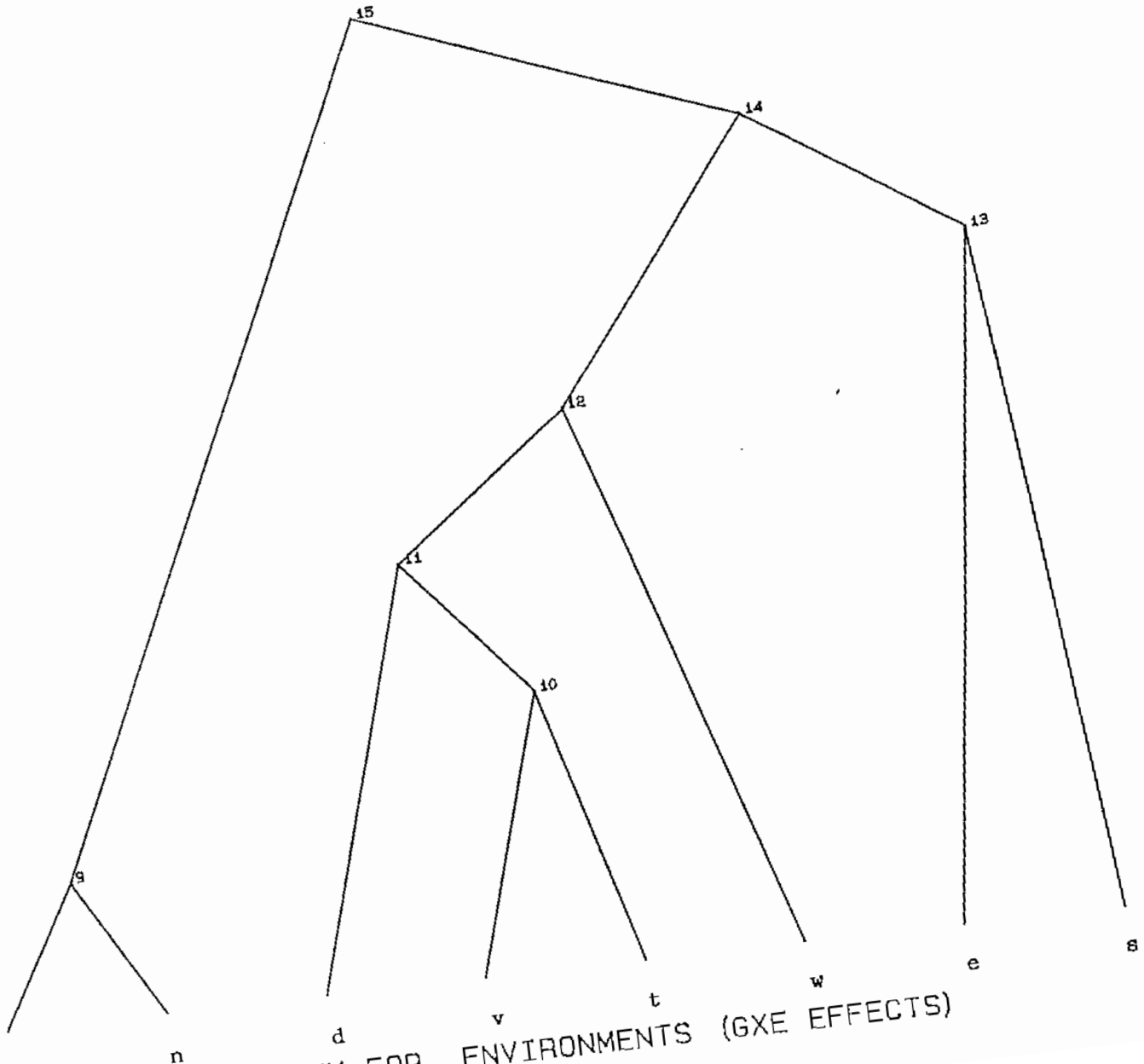
5.4 77/78 environments

Biloela and West Namoi (group 9) have high site mean yields and similar ge.

Theodore and Myall Vale (group 10) have low site mean yields and similar ge.

Grouping of environments is partly related to site mean yield and is not related to geographical position.

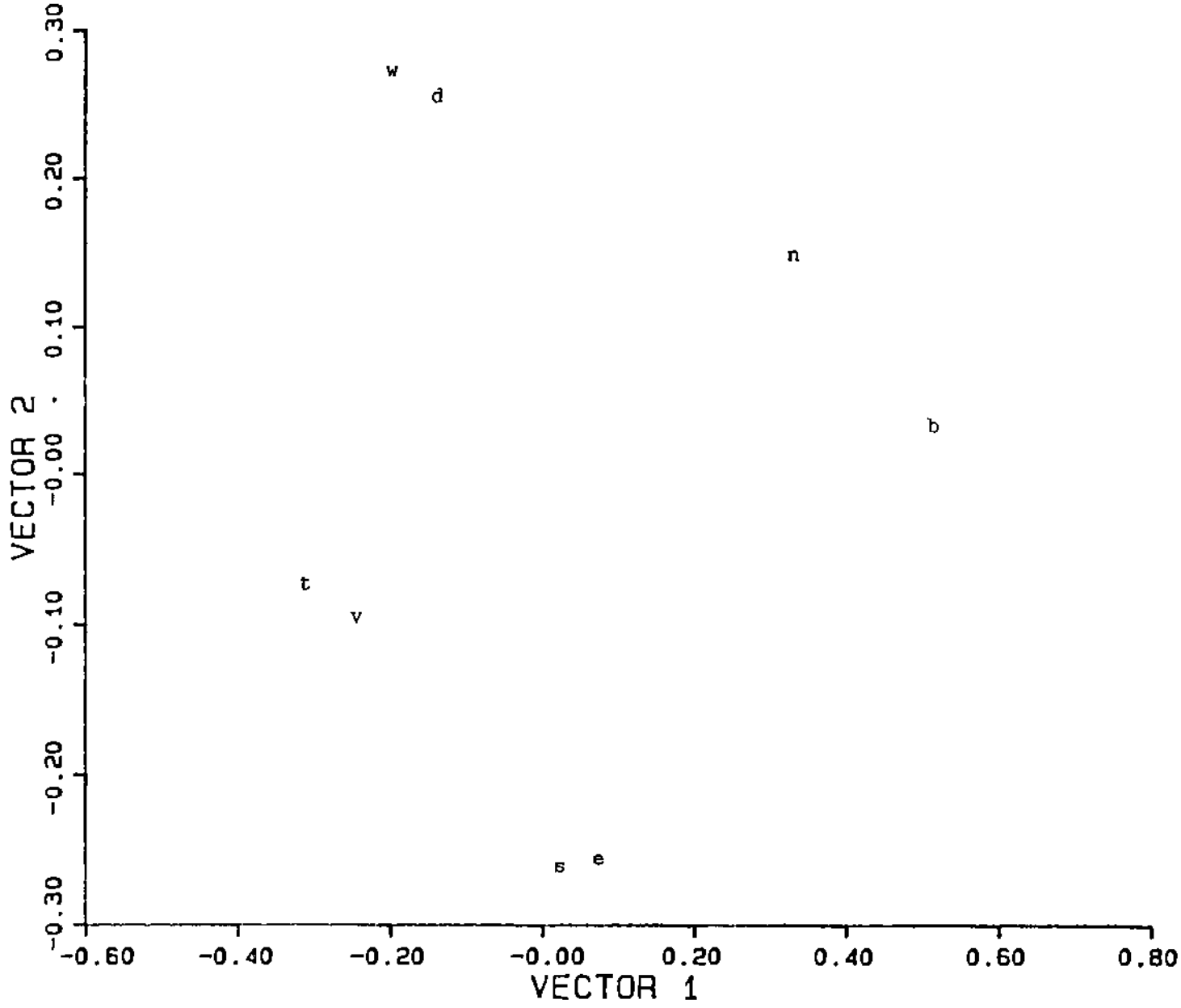
77/78 environments



HIERARCHY FOR ENVIRONMENTS (GXE EFFECTS)

1977/78 LINT YLD(GE) ENVIRONMENT ORDINATION

ge accounted by two vectors 54%

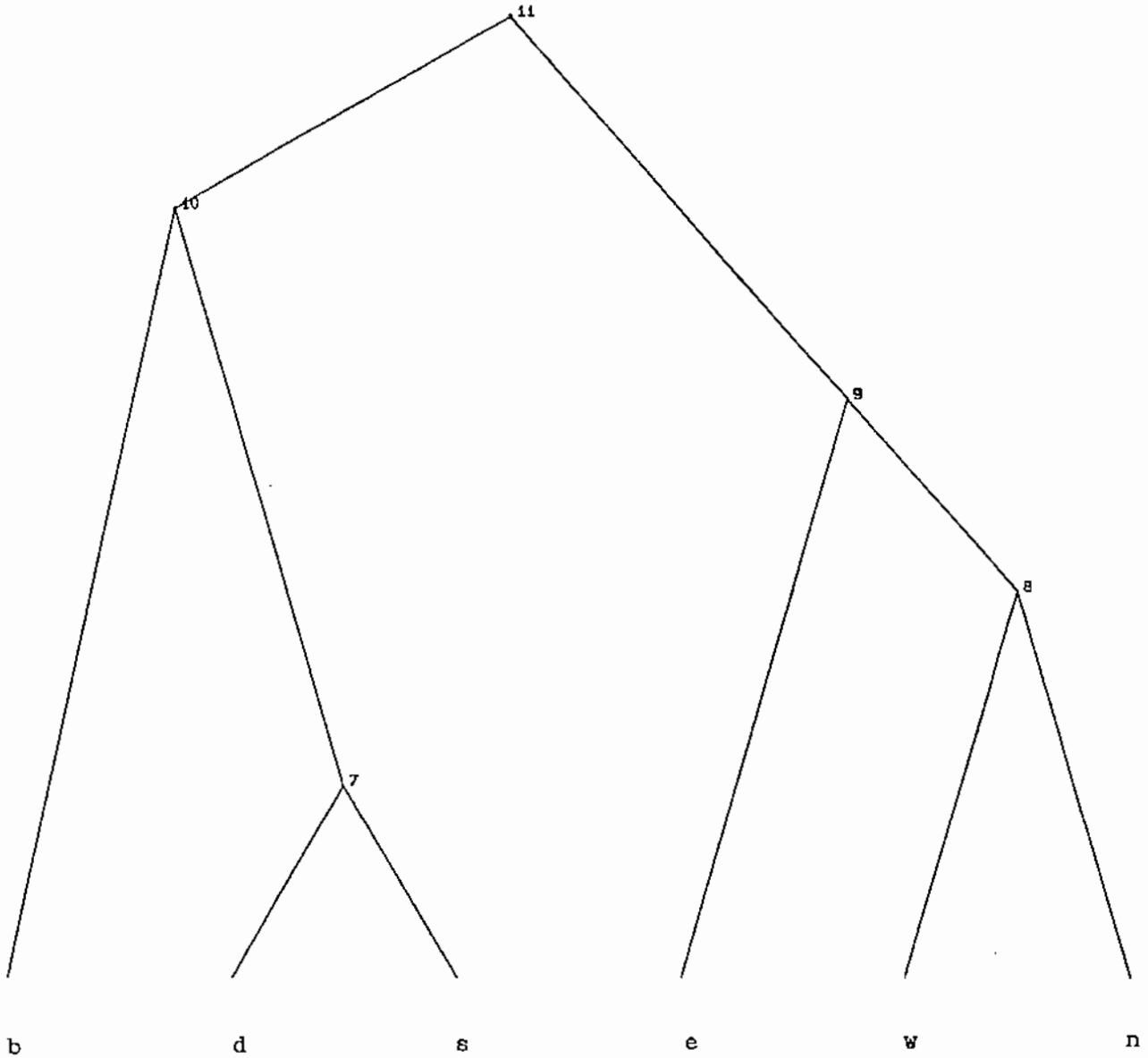


5.5 78/79 environments

Darling Downs and St George (group 7) have low site mean yields and similar ge.

Grouping of environments is not related to geographical position but is partly related to site mean yield.

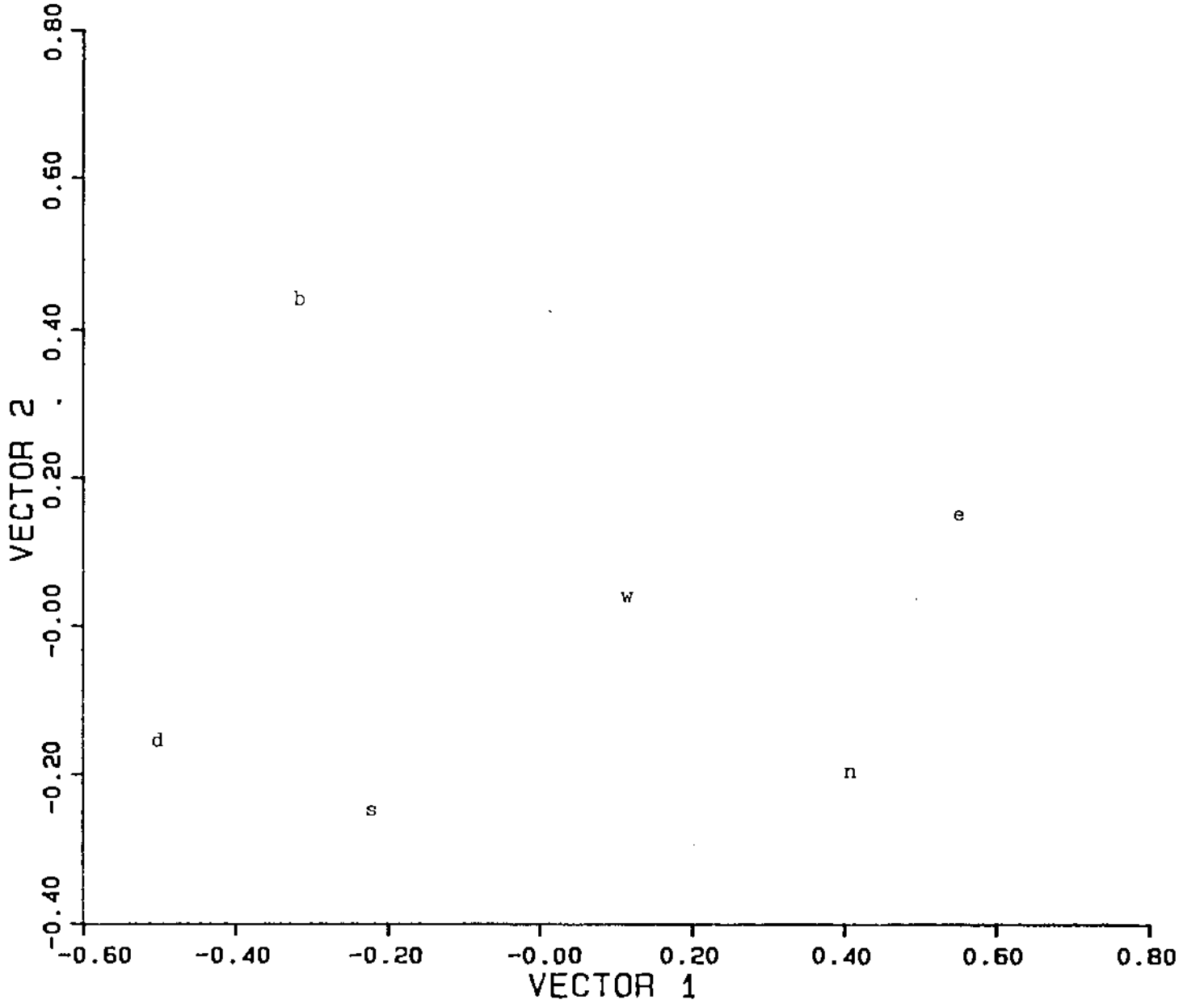
78/79 environments



HIERARCHY FOR ENVIRONMENTS (GXE EFFECTS)

1978/79 LINT YLD(GE) ENVIRONMENT ORDINATION

ge accounted by two vectors 75%

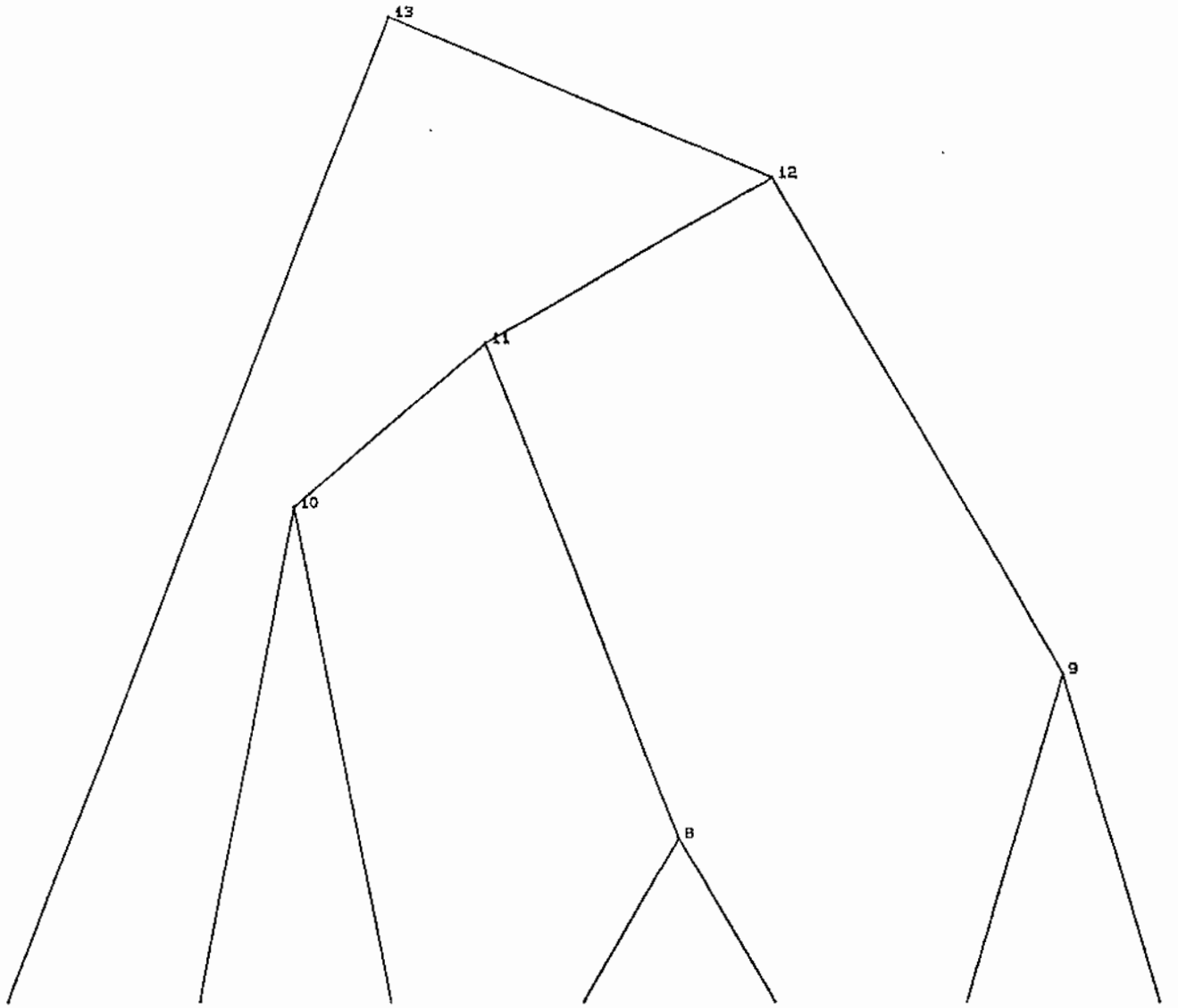


5.6 79/80 environments

Biloela ge is different from all other environments.

Grouping of environments is not related to site mean yield nor geographical position.

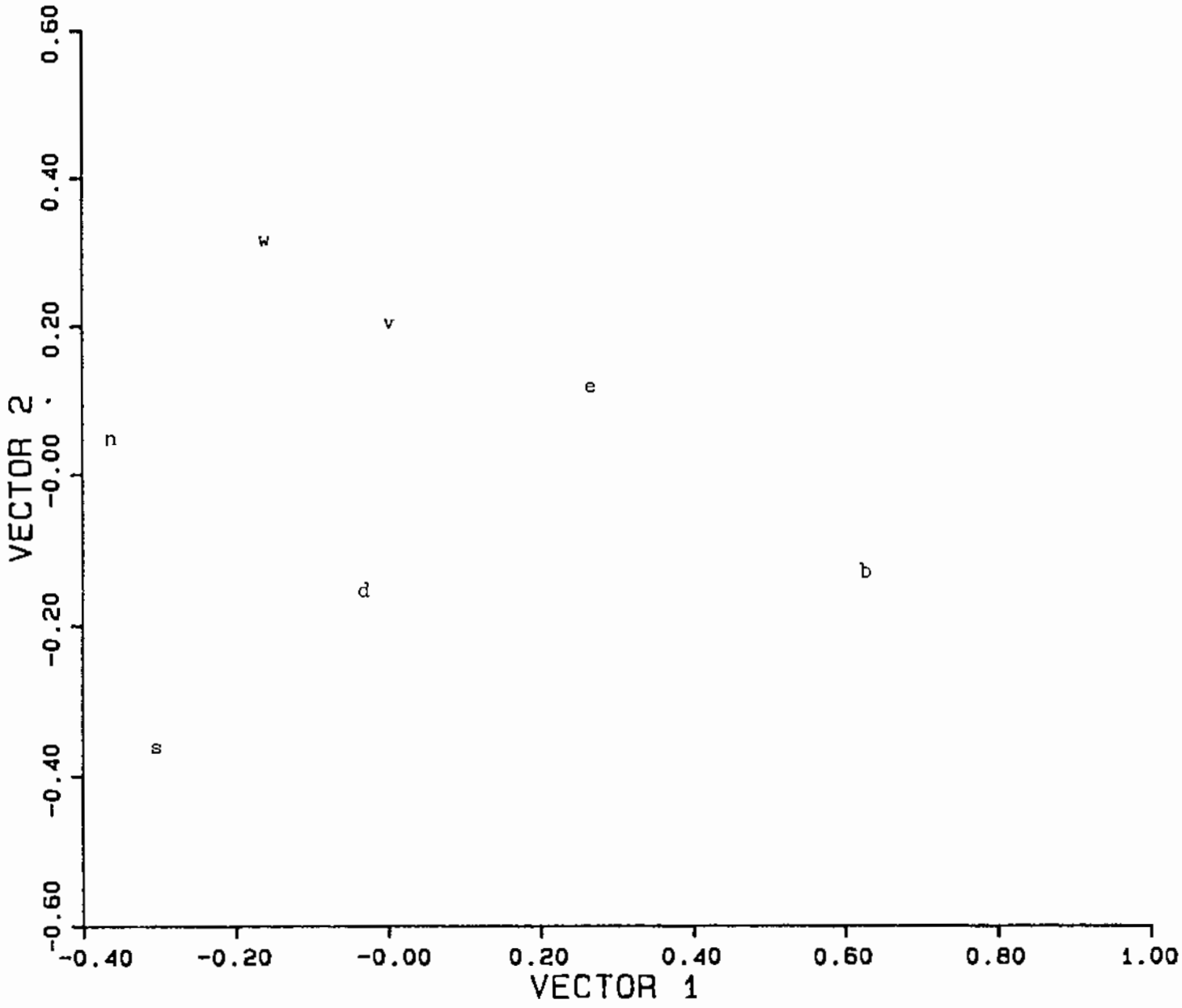
79/80 environments



HIERARCHY FOR ENVIRONMENTS (GXE EFFECTS)

1979/80 LINT YLD (GE) ENVIRONMENT ORDINATION

ge accounted by two vectors 70%



5.7 80/81 environments

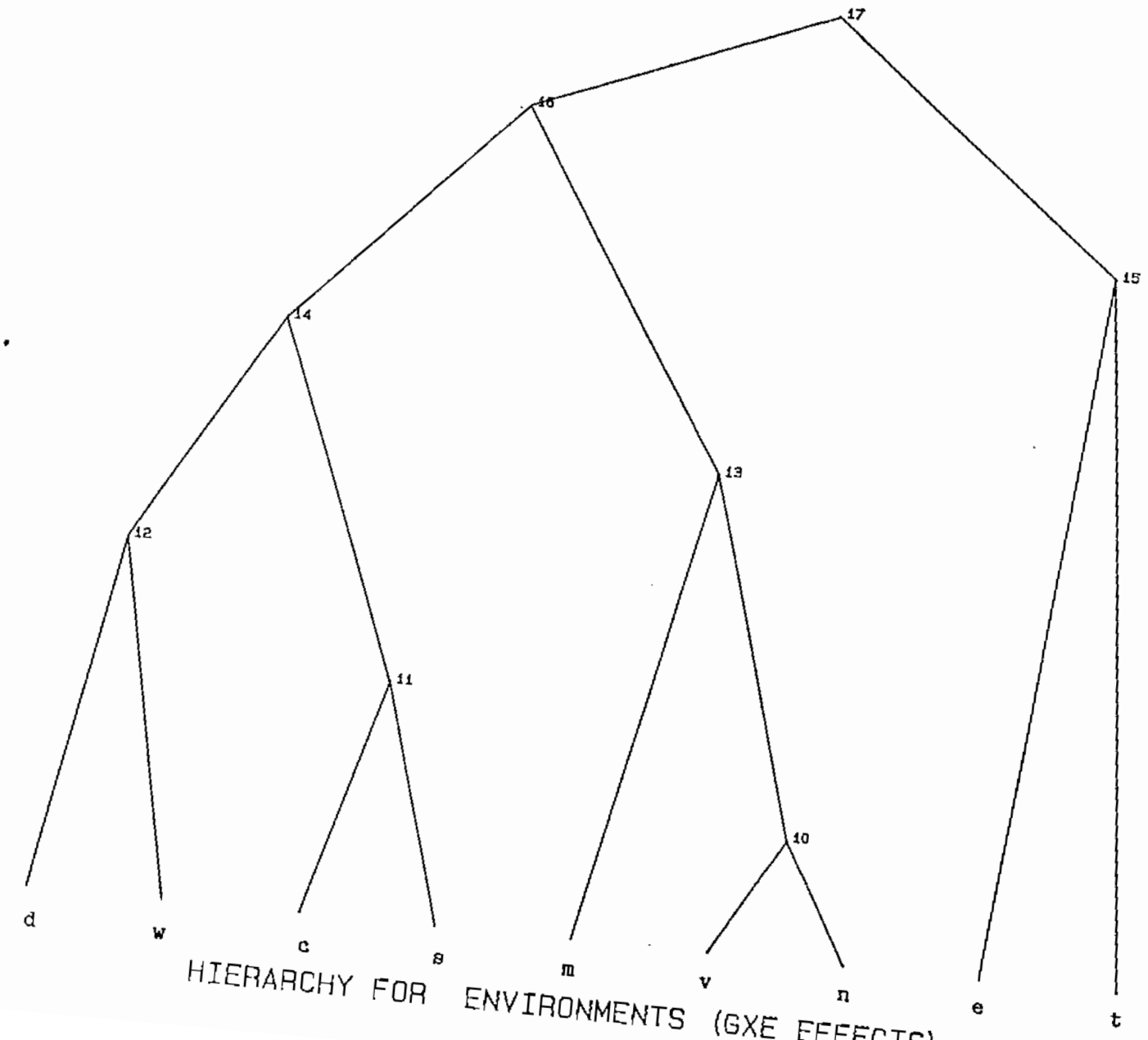
group 15 - central Qld environments.

group 13 - three NSW environments (Moree, Myall Vale, West Namoi) all with high site mean yield and similar ge.

group 12 - Darling Downs and Warren have low site mean yields and similar ge.

Grouping of environments is partly related to geographical position and partly related to site mean yield.

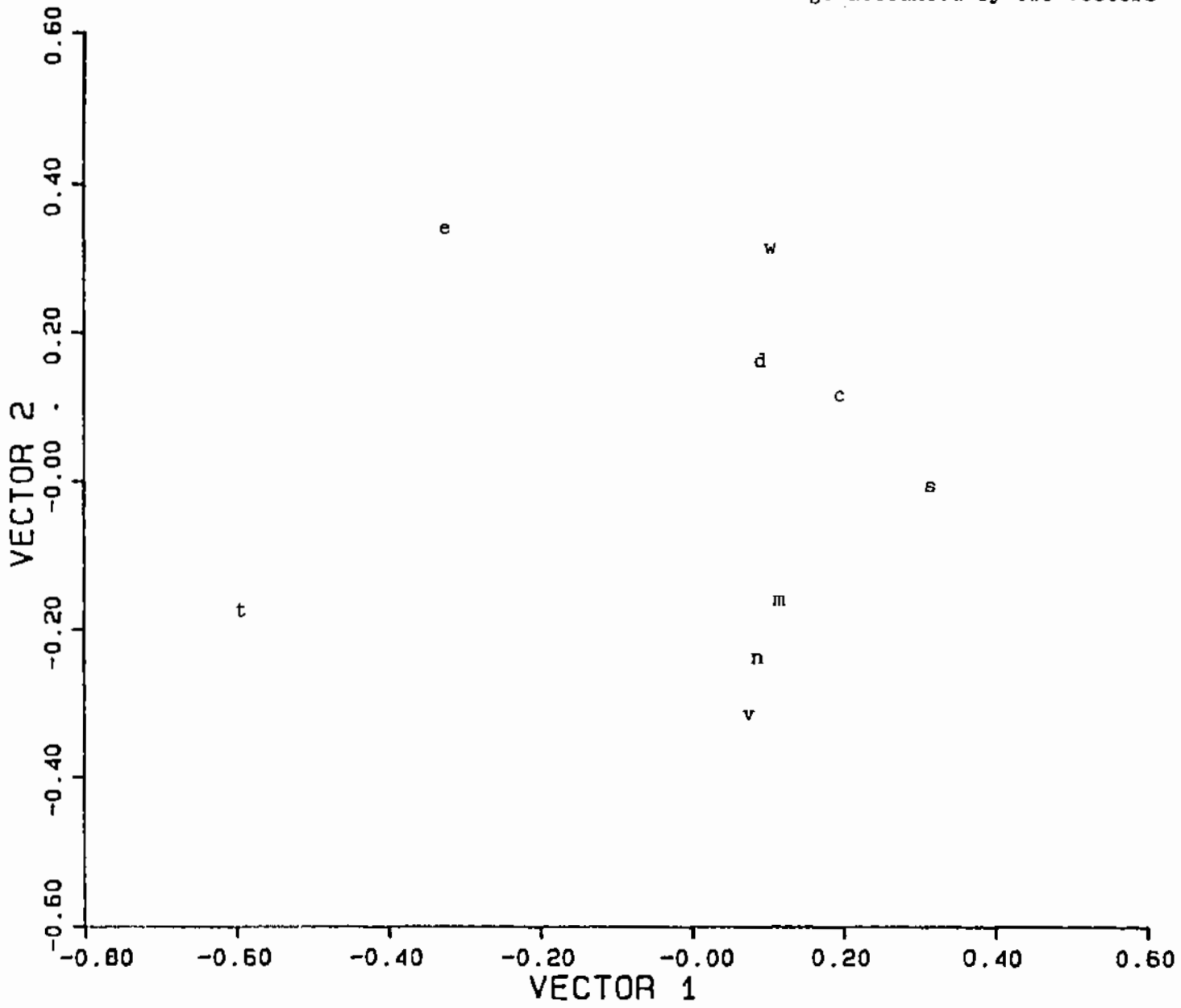
80/81 environments



HIERARCHY FOR ENVIRONMENTS (GXE EFFECTS)

1980/81 LINT YLD(GE) ENVIRONMENT ORDINATION

ge accounted by two vectors 62%



5.8 81/82 environments

All locations have relatively high site mean yields in comparison with other years.

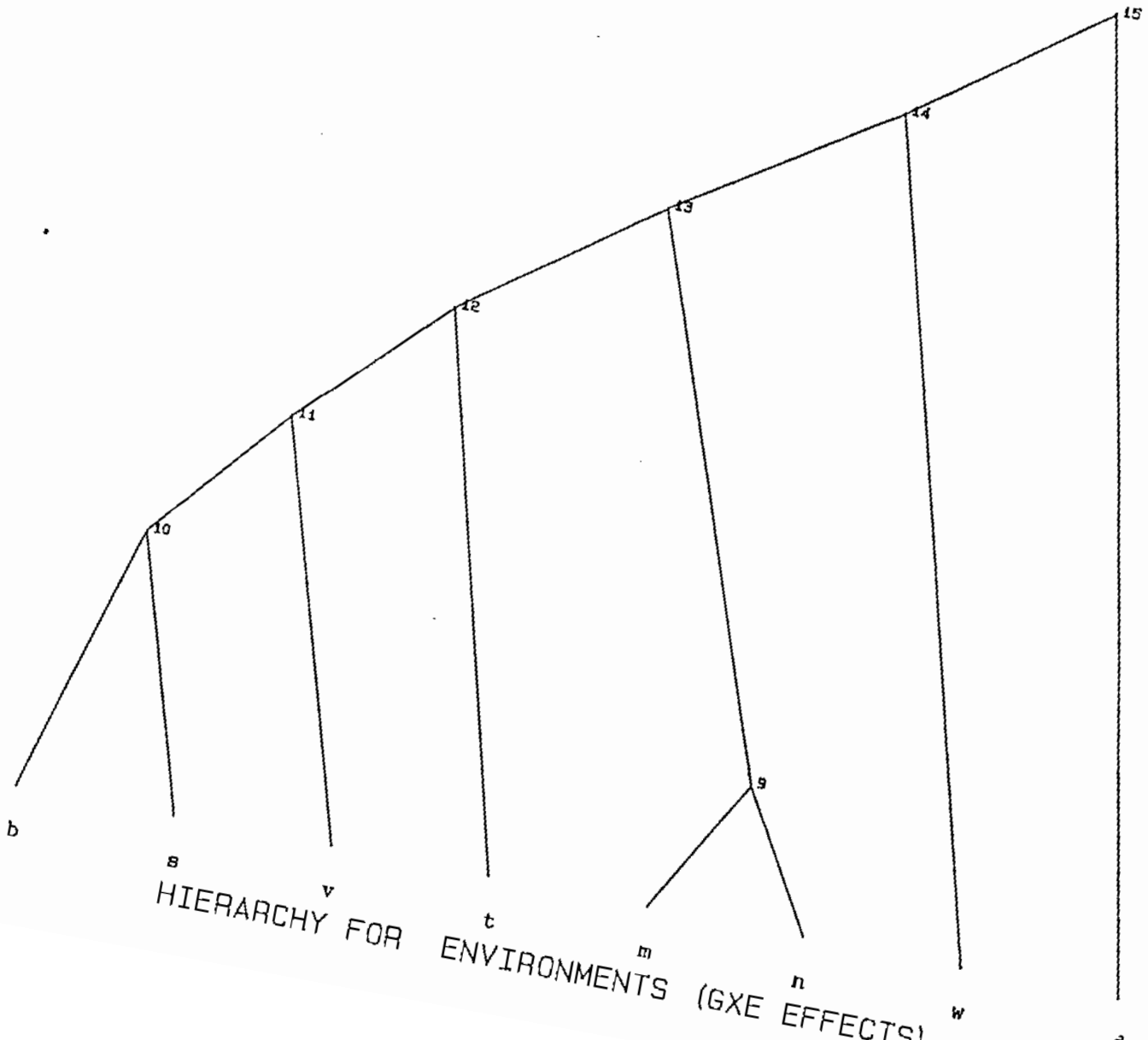
Moree and West Namoi (group 9) have similar site mean yields and similar ge.

Biloela and St George (group 10) have lower site mean yields and similar ge.

Darling downs and Warren ge are different from other locations and different from each other.

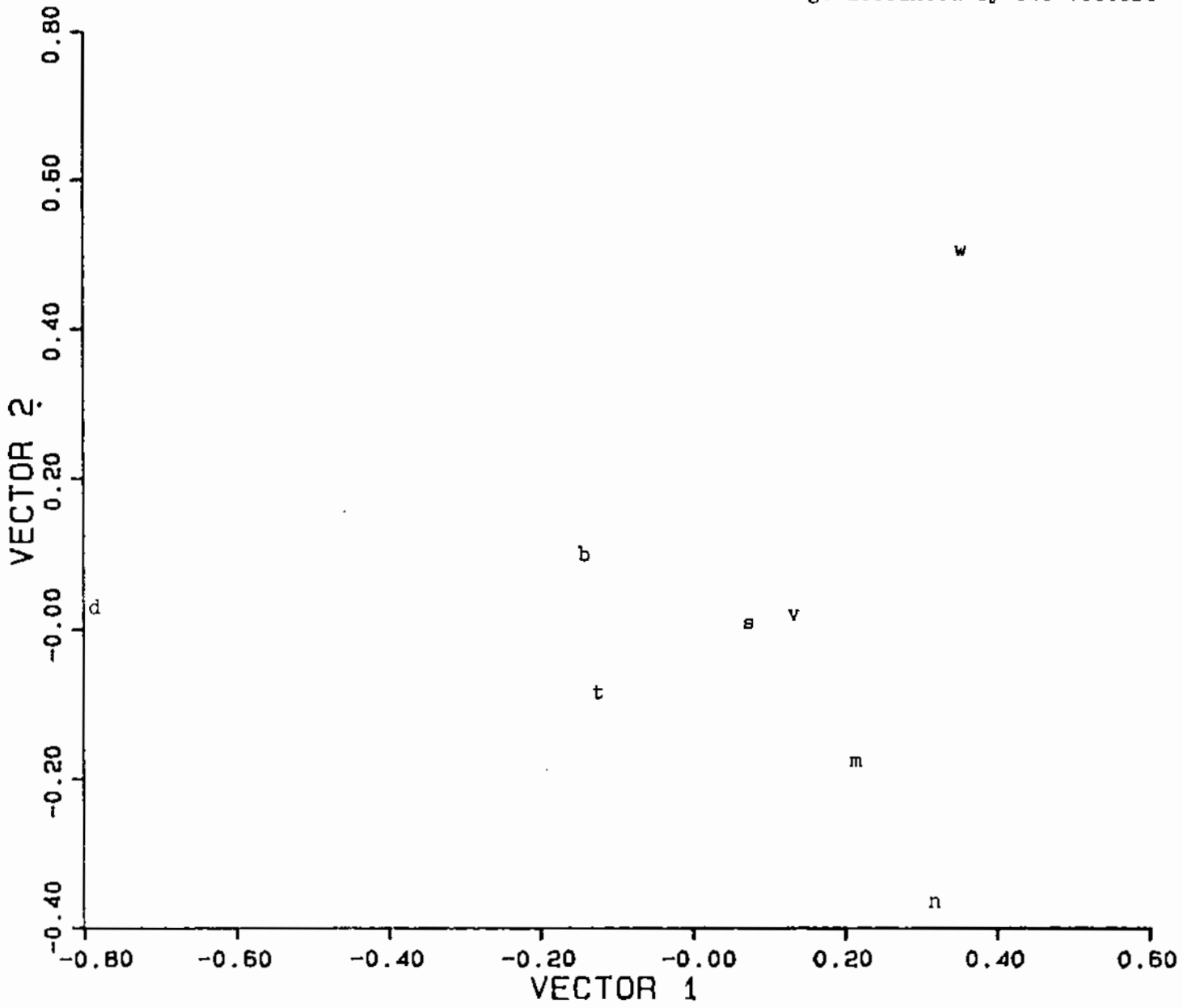
Grouping of environments is not related to site mean yield nor geographical position.

81/82 environments



1981/82 LINT YLD (GE) ENVIRONMENT ORDINATION

ge accounted by two vectors 64%



5.9 82/83 environments

At the two group level there is a definite grouping into NSW and Qld locations based on ge

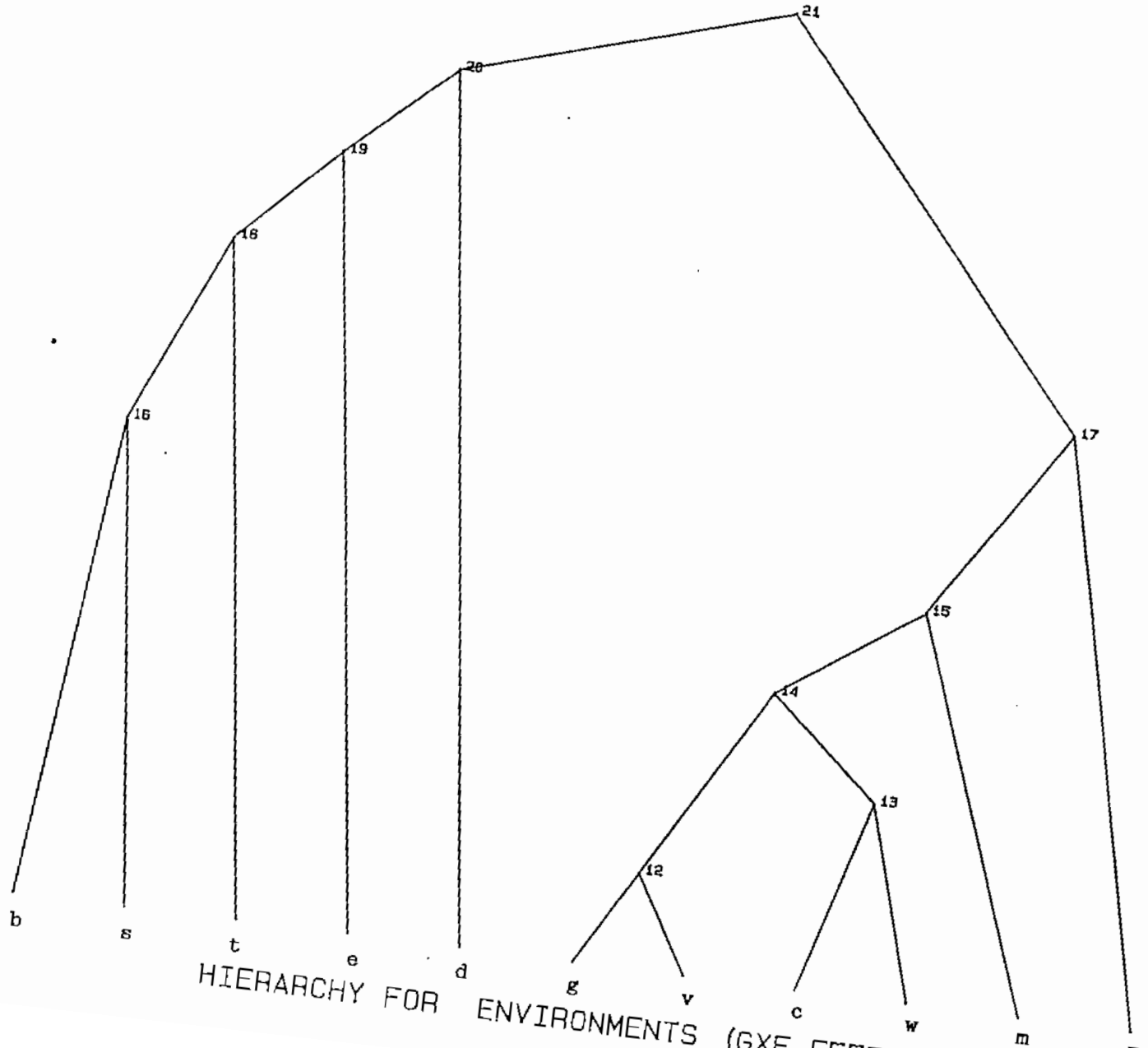
group 17 - all NSW locations, all with similar ge

group 20 - all Qld locations
- this group has greater within group ge variation as compared to the NSW group.
- st george is intermediate to NSW locations and Central Queensland locations.

Warren and Moomin Creek (fusion 13) have similar site mean yields and similar ge.

Grouping of environments is related to geographical position and is not related to site mean yields.

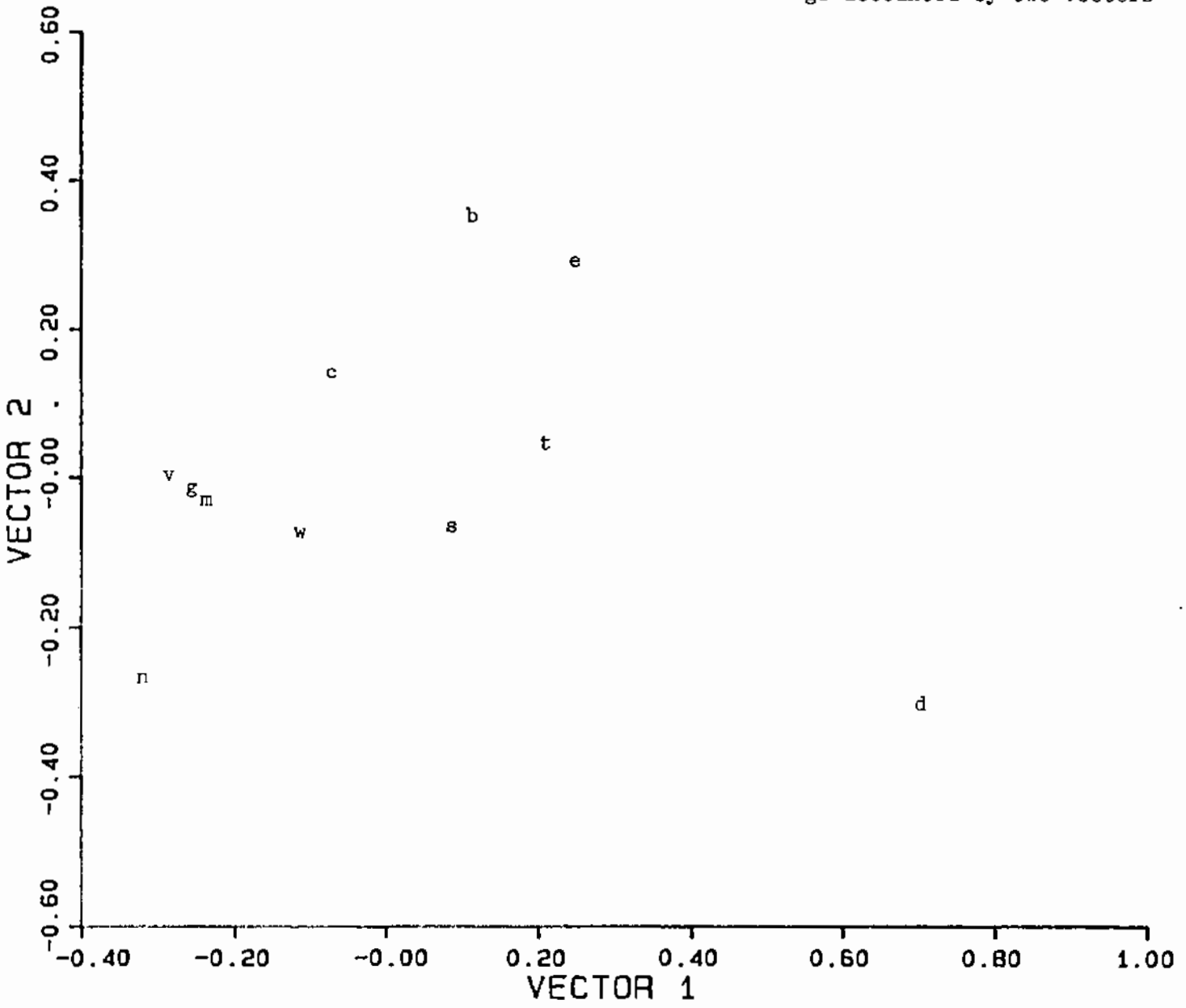
82/83 environments



HIERARCHY FOR ENVIRONMENTS (GXE EFFECTS)

1982/83 LINT YLD(GE) ENVIRONMENT ORDINATION

ge accounted by two vectors 51%



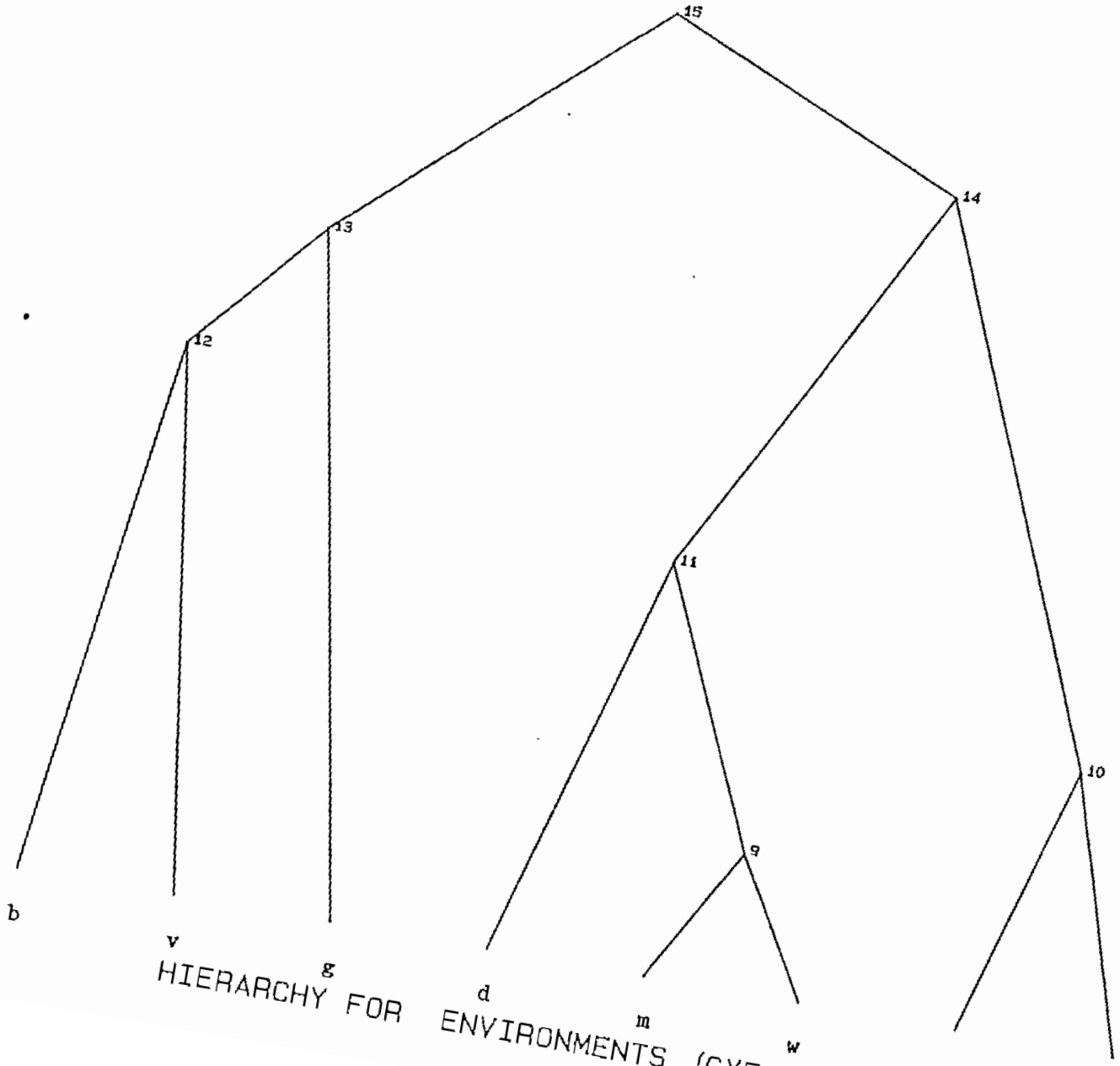
5.10 83/84 environments

West Namoi and Moomin Creek (fusion 10) have similar site mean yields and similar ge.

Myall vale is the odd location in comparison with the other locations in the Namoi and Gwydir.

Grouping of environments is not related to site mean yields.

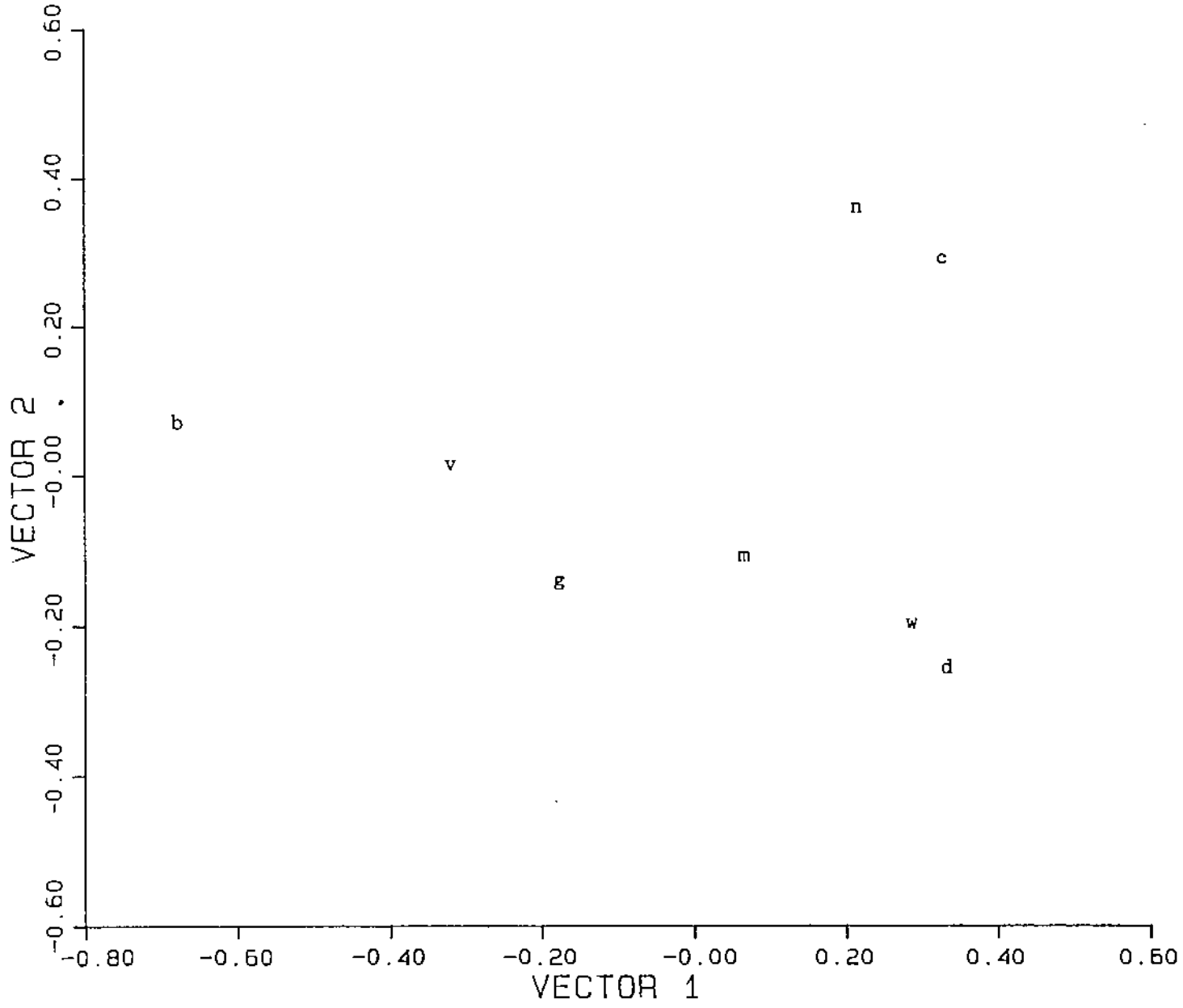
83/84 environments



HIERARCHY FOR ENVIRONMENTS (GXE EFFECTS)

1983/84 LINT YLD (GE) ENVIRONMENT ORDINATION

ge accounted by two vectors 74%



5.11 84/85 environments

Darling Downs ge is different from all other environments.

Considering the three group level, we have

group d - Darling downs

group 15 - only NSW locations

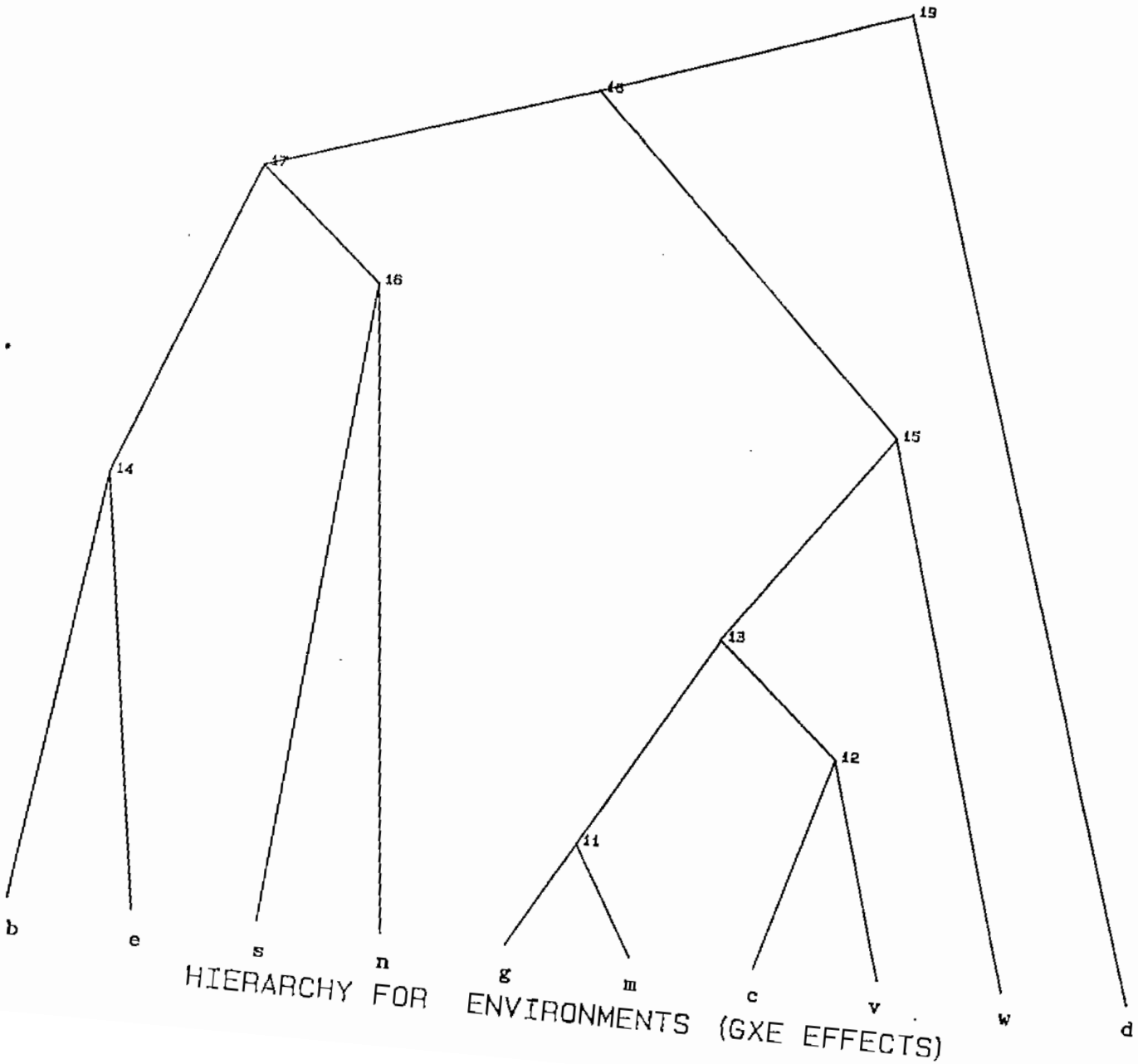
group 17 - three Qld locations, plus West Namoi.

Moomin Creek and Myall Vale (group 12) have similar site mean yields and similar ge.

Boggabilla and Moree (group 11) have similar site mean yields and similar ge.

Grouping of environments is not related to site mean yield but is partly related to geographical position.

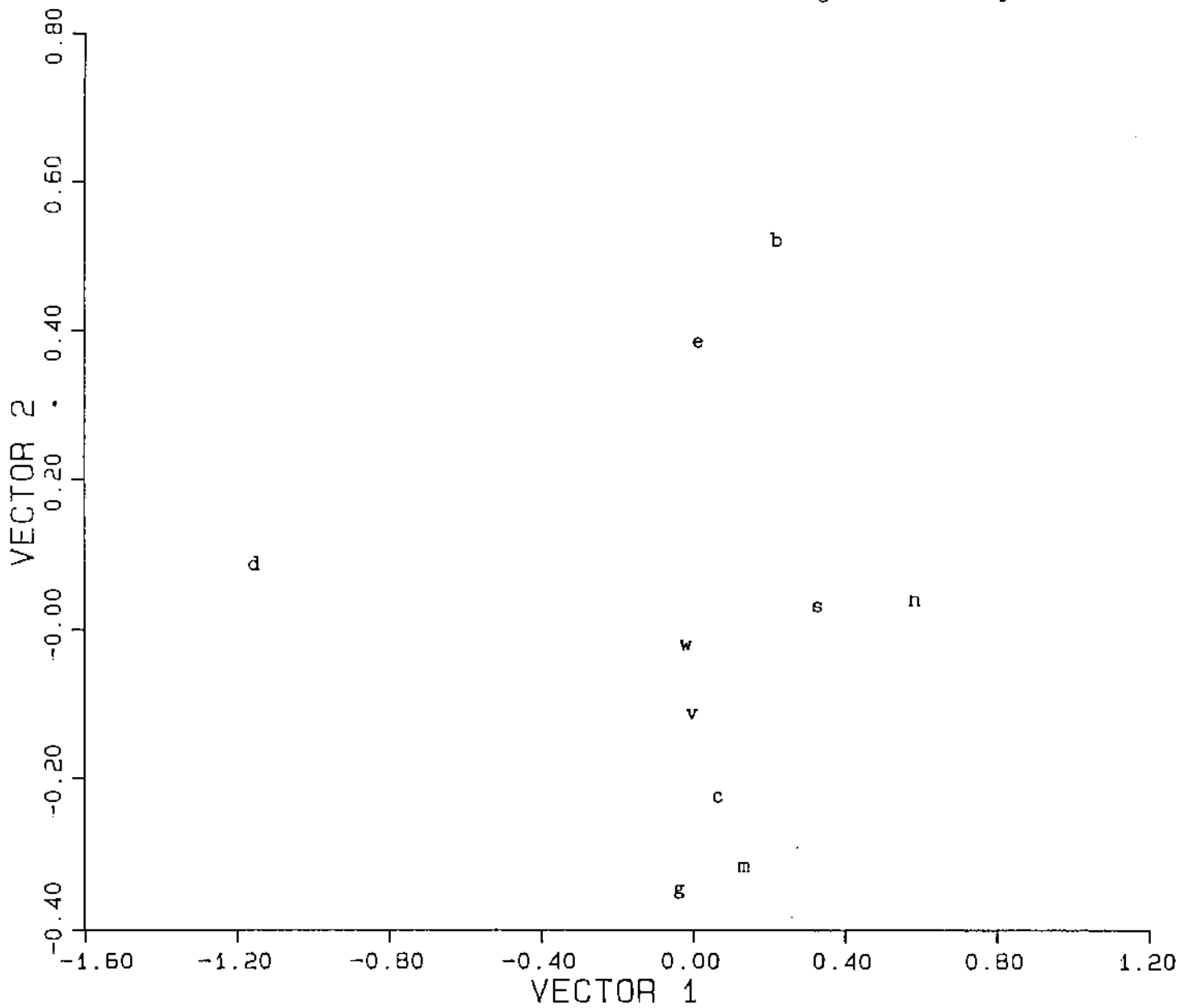
84/85 environments



HIERARCHY FOR ENVIRONMENTS (GXE EFFECTS)

1984/85 LINT YLD (GE) ENVIRONMENT ORDINATION

ge accounted by two vectors 71%



5.12 85/86 environments

Considering the two group level, we have

group 18 - locations in NSW and st george

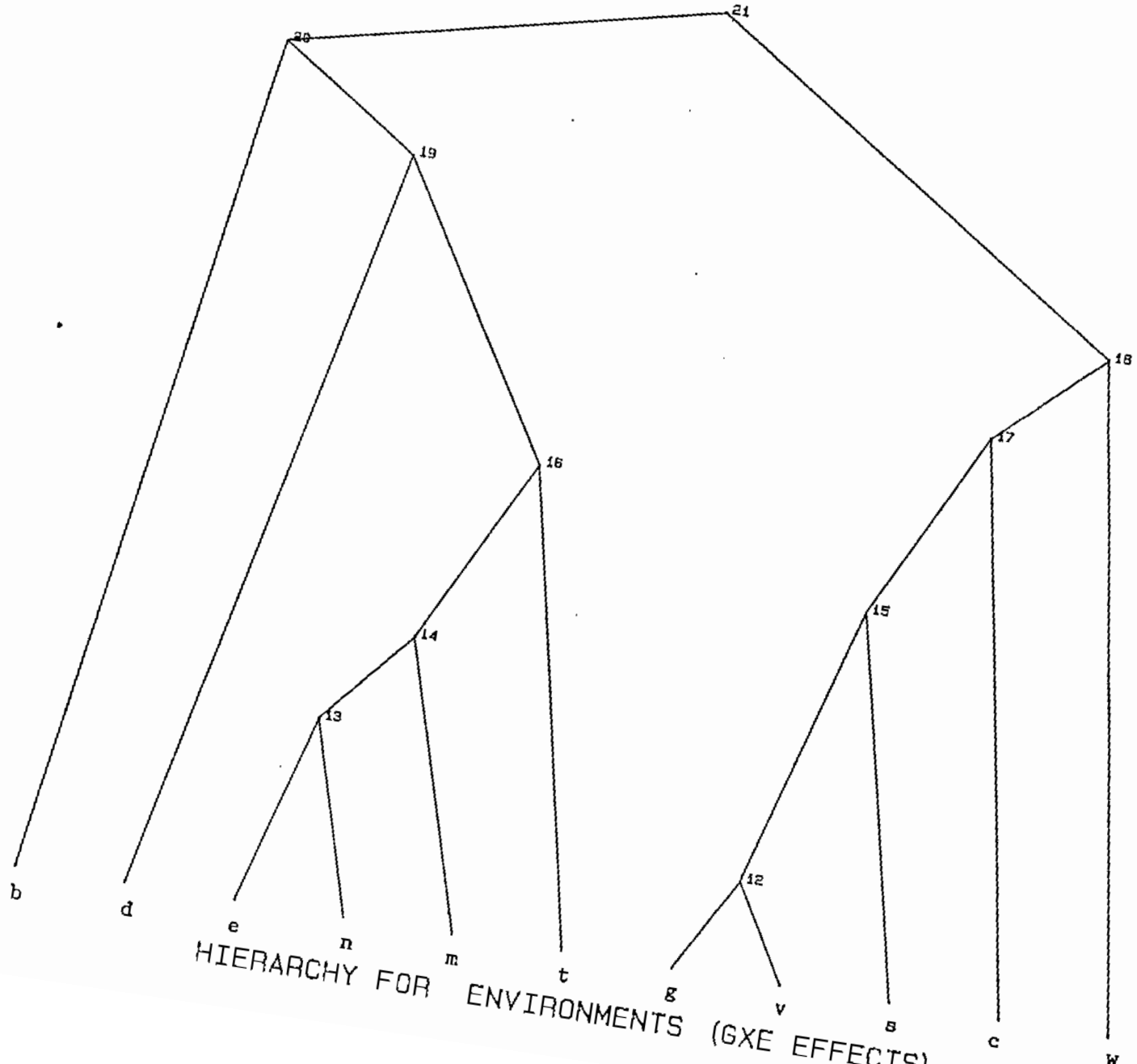
group 20 - all Qld locations plus two NSW locations

Emerald and West Namoi (group 13) have similar site means and similar ge.

Boggabilla and Myall Vale (group 12) have high site mean yields and similar ge.

Grouping of environments is partly related to geographical position.

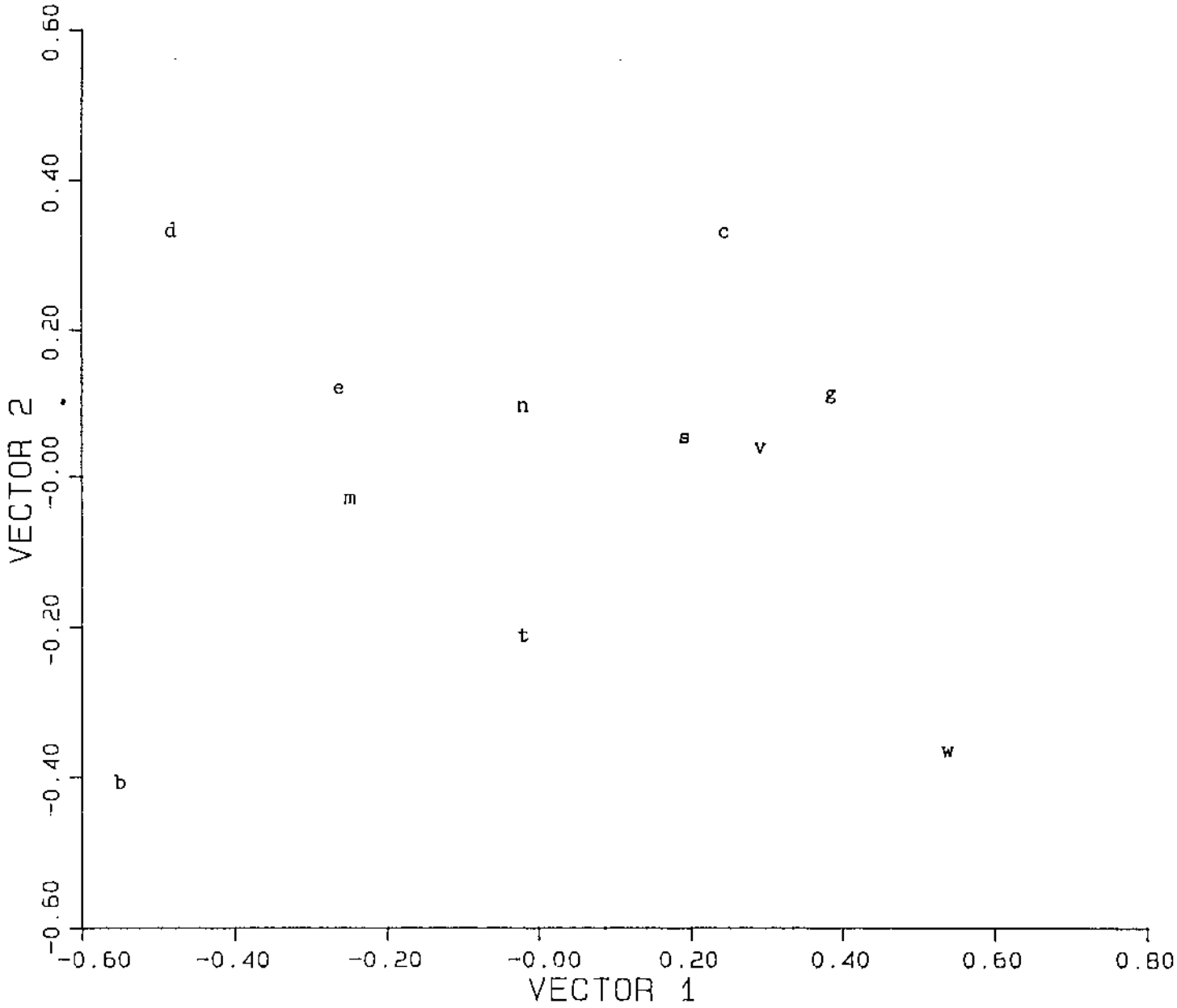
85/86 environments



HIERARCHY FOR ENVIRONMENTS (GXE EFFECTS)

1985/86 LINT YLD (GE) ENVIRONMENT ORDINATION

ge accounted by two vectors 72%



5.13 Summary

years 74/75 to 79/80 - grouping of locations based on ge effects is partly related to site mean yield and is partly related to geographical situation.

- in some years Biloela has a ge which is quite different from other locations.

years 80/81 to 85/86 - grouping of locations based on ge effects is partly related to geographical position and is definitely not related to site mean yield.

- in some years Darling Downs has a ge which is quite different from other locations.

6. CLASSIFICATION of ENVIRONMENTS - COMBINED YEARS

For each combined year data set, the classification of environments is considered by examining :-

(i) the within group composition for similarities of environments with regards to years and/or geographical location (Appendix G).

(ii) the dendogram illustrating the classification of environmental groups.

(iii) the scatter diagram of the first two vectors of the principal component analysis.