

No evidence for a genetic basis of tongue rolling or hand clasping

N. G. MARTIN

OCCASIONALLY one still finds in elementary genetics courses and elsewhere, the ability to roll the tongue and the manner of clasping the hands cited as examples of simply inherited human polymorphisms. This is despite extensive evidence to the contrary that has accumulated over several decades.

Sturtevant⁷ found that about 65 percent of persons studied were able to turn up the edges of the tongue and although some people were able to learn the ability, family data indicated that it was inherited as a simple dominant allele. However, Matlock⁶ reported 7 out of 33 monozygotic (MZ) twin pairs discordant for the ability, and Sturtevant⁸ concluded that "there is sufficient nongenetic influence to make the character practically useless as a genetic marker." He confessed to being "still embarrassed to see it listed in some current works as an established Mendelian case." Ten years later the myth is still not quite dead.

A similar story applies to handclasping. Lutz⁴ observed that when the hands are clasped naturally most people will put the same thumb—either left or right—uppermost every time.

In progeny of R × R matings 72 percent (95/135) were R claspers while from L × L matings 42 percent (22/56) were R claspers so Lutz concluded that the trait was under genetic, if not simple Mendelian control. Subsequently, Dahlberg¹ found equal proportions

of discordant pairs among MZ (34/69) and DZ (56/123) twin pairs. Other studies^{2,3} have found little or no evidence for a genetic component in handclasping from different family relationships.

Tongue rolling and handclasping data from a recent twin study presented here confirm the findings of earlier twin studies. A sample of 47 same-sex twin pairs all aged about 20 years was scored for these two characters. The ascertainment of the sample and its sex and zygosity composition have been reported elsewhere⁵. Table I shows the distribution of the two traits in MZ and DZ twin pairs. There is no evidence for greater concordance in MZ pairs in either trait. The 3 × 2 contingency tables are not strictly applicable because some of the expected numbers are less than five. If concordant classes are grouped the equal concordance of MZ and DZ twins is seen even more clearly for both tongue rolling ($\chi^2 = 0.01$) and hand clasping ($\chi^2 = 0.51$).

This does not exclude the possibility of polygenic predisposition towards one or other morph but any such influence must be slight.

It is possible that patterns of family similarity that have been observed could arise from mimicry of parental behavior when children are learning different motor activities. If this were so one would expect to find significant concordance in both MZ and DZ pairs. Since there is no heterogeneity in the pattern of concordance between MZ and DZ pairs, we can pool them to make an overall test of concordance as shown in Table II.

The discordant pairs are divided equally between the two discordant cells. It appears that the behavior of one twin of a pair is independent of the behavior of the other in both traits. However, the family studies mentioned indicate that there is some parental influence in both tongue rolling and hand clasping. If there is any such influence in these data it is not large enough to be detected.

We must conclude that most of the variance in these traits arises from the specific environmental influences and chances that affect the individual. These

Table I. Concordance for tongue rolling and hand clasping in a sample of MZ and DZ twin pairs

Tongue rolling	MZ	DZ	Total
Both rollers	15	10	25
One roller, one nonroller	8	6	14
Both nonrollers	5	3	8
Total	28	19	47
$\chi^2 = 0.06$			$P > 0.05$
Hand clasping	MZ	DZ	Total
R - R	9	1	10
R - L	12	11	23
L - L	7	7	14
Total	28	19	47
$\chi^2 = 4.90$			$P > 0.05$

Table II. Concordance for tongue rolling and hand clasping in all twin pairs

Tongue rolling	Twin 1		
	+	-	
Twin 2	25	7	32
	7	8	15
Total	32	15	47
$\chi^2 = 3.32$			$P > 0.05$
Hand clasping	Twin 1		
	R	L	Total
Twin 2	10	11.5	21.5
	11.5	14	25.5
Total	21.5	25.5	47
$\chi^2 = 0.001$			$P > 0.05$

traits illustrate the point that family resemblances reveal little about genetic or environmental determination in the absence of data from twins or relatives reared apart.

Literature Cited

1. DAHLBERG, G. Twin Births and Twins From a Hereditary Point of View. Bokforlags A. B. Tidens Trycken, Stockholm. 1926.
2. FERRONATO, S., D. THOMAS, and D. SADAVA. Preferences for handedness, arm folding and handclasping in families. *Human Hered.* 24:345-351. 1974.
3. LAI, L.Y.C. and R.J. WALSH. The patterns of hand

clasping in different ethnic groups. *Human Biol.* 37:312-319. 1965.

4. LUTZ, F.E. The inheritance of the manner of clasping the hands. *Am. Nat.* 42:195-196. 1908.

5. MARTIN, N.G. and P.G. MARTIN. The inheritance of scholastic abilities in a sample of twins. I. Ascertainment of the sample and diagnosis of zygoty. *Ann. Human Genet.* in press. 1975.

6. MATLOCK, P. Identical twins discordant in tongue-rolling. *J. Hered.* 43:24. 1952.

7. STURTEVANT, A.H. A new inherited character in man. *Proc. Natl. Acad. Sci.* 26:100-102. 1940.

8. ———. A History of Genetics. Harper and Rowe, New York. 1965.

Inheritance of purple testa in sorghum

A. J. CASADY

SEEDS of some sorghum, *Sorghum bicolor* (L.) Moench, varieties have a layer of cells, known as testa, immediately outside the aleurone. The testa is usually brown²⁻⁶. However, Ayyanger and Krishnaswami¹ reported colorless testa, and the sorghum line IS 10609C has a purple testa. Sieglinger⁴ reported that the presence of testa was controlled by a single dominant allele, denoted *B*. Stephens⁵ reported a second dominant allele, denoted *B*₂, for the presence of testa, and he demonstrated that *B* and *B*₂ were complementary for the presence of testa. Quinby and Martin² and Schertz and Stephens³ suggested that *B* be changed to *B*₁.

Material and Methods

The pure line KS18, as the female parent, was crossed with IS 10609C. KS18 had no testa and was known to have the genotype *b₁b₁ B₂B₂*. Because IS 10609C had a testa, it was presumed its genotype was *B₁B₁B₂B₂*. The F₁ and F₂ progenies of the cross were grown in the field in 1972 and 1974, respectively.

The author is research agronomist, Agricultural Research Service, U.S. Department of Agriculture, Department of Agronomy, Kansas State University, Manhattan, Kansas 66506. Cooperative investigation of the Agricultural Research Service, U.S. Department of Agriculture and the Department of Agronomy, Kansas Agricultural Experiment Station. Contribution no. 1480, Department of Agronomy, Kansas Agricultural Experiment Station.

The Journal of Heredity 66:180. 1975.

Results and Discussion

Seeds of the F₁ progeny had a brown testa, indicating that KS18 possessed a dominant allele for brown testa. In the F₂ progeny, testa was present in 703 plants and absent in 226. That segregation did not deviate significantly ($\chi^2 = 0.22$, $P = 0.75-0.50$) from a 3:1 ratio as reported by other investigators. The 703 plants with testa had a segregation of 545 brown testa and 158 purple testa, close to a 3:1 ratio ($\chi^2 = 2.39$, $P = 0.25-0.10$). The results showed that brown vs. purple testa was controlled by a single pair of alleles, with brown dominant. The symbols *Tp* and *tp* have been assigned to denote brown and purple testa, respectively.

Summary

An inheritance study of testa color in sorghum seed showed brown vs. purple testa to be controlled by a single pair of alleles, with brown dominant. The symbols *Tp* and *tp* have been designated to denote brown and purple testa, respectively.

Literature Cited

1. AYYANGER, G.N.R. and N. KRISHNASWAMI. Studies on the histology and coloration of the pericarp of the sorghum grain. *Indian Acad. Sci. Proc.* 14:114-136. 1941.

2. QUINBY, J.R. and J.H. MARTIN. Sorghum improvement. In *Advances in Agronomy* 6:305-359. 1954.

3. SCHERTZ, K.F. and J.C. STEPHENS. Compilation of gene symbols, recommended revisions and summary of linkages for inherited characters of *Sorghum vulgare* Pers. *Texas Agr. Expt. Sta. Tech. Monogr.* 3. 1966.

4. SIEGLINGER, J.B. Seed color inheritance in certain grain sorghum crosses. *J. Agr. Res.* 27:53-64. 1924.

5. STEPHENS, J.C. A second factor for subcoat in sorghum seed. *J. Am. Soc. Agron.* 38:340-342. 1946.

6. SWANSON, A.F. Seed-coat structure and inheritance of seed color in sorghums. *J. Agr. Res.* 37:577-588. 1928.