value (P_0) but it is increasing rapidly. At this stage the increase in stiffness closely follows the increase in tension after correcting for the compliance of the external connective tissue[6]. As tension rises to P_0 the sarcomere contraction velocity falls and values derived from the figure show that a conventional (A.V. Hill-type) hyperbolic force-velocity relationship is applicable even in this non-steady state situation of developing tetanus.

Recent high time-resolution X-ray diffraction experiments have shown that the proportion of crossbridges that have moved out to the actin filaments during tetanus[7] and twitch[8] also increases more rapidly than the tension ($\Delta t_{1/2}$ = 15 and 30 msec resp. at 0–2 °C). It appears that most of the sarcomere shortening is complete and most of the tetanic crossbridge attachments are made before the tension has reached more than 80% of its final value. The smallness of the further shortening as the remaining tension is built up reflects the high nonlinearity of the muscle system – particularly the tendon at either end which stiffens by several orders of magnitude as the full tetanic tension is developed.

That the time course of the 1,1 and 1,0 X-ray diffraction reflections is paralleled by the time course of sarcomere contraction before tension develops may in part be ex plained by the fact that sarcomeres shorten at the expense of elastic elements including tendon. Thus actin and myosin filament overlap increases more rapidly than if the muscle was held rigidly isometric during the development of tension.

The behaviour after stimulus ceases appears paradoxical but is explained by heterogeneity in the muscle. As activity decreases the sarcomeres which weaken first expand abruptly allowing the rest of the muscle to contract further; this has been observed both directly[4,9] and indirectly[10]. The net effect is for the average sarcomere length to decrease only slightly while the tension falls quite steeply, as seen in the figure.

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The non-inheritance of the direction of foliar spiral in coconut

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Summary. The leaves on a coconut crown are arranged in 5 spirals, all running clockwise in one palm, and counter-clockwise in another. The 2 types of palms in any plantation are distributed more or less equally. Data on the foliar spirality of the progeny obtained by different kinds of parental matings clearly show that the direction of foliar spiral in the coconut is not genetically determined. Additional data presented on 7860 palms show that the left-spiralled ones are in excess of the right-handeds.

The leaves of the coconut (*Cocos nucifera* L.) are produced one after another (spiral phyllotaxis), the angle of deflection between any 2 consecutive leaves being about 138 degrees[2-9]. By following the production sequence of leaves, one can trace out a single spiral in a crown which is the genetic spiral. In addition to this, there are 5 clearcut spirals running opposite the single genetic spiral. In this communication we always refer to the 5 obviously visible spirals. All the 5 spirals in one crown veer clockwise and in another, counter-clockwise[2,6,7]. There are also other ways of determining the direction of foliar spirals. If in a palm the spadix appears on the right side of its supporting leaf, the foliar spiral is left-handed. In a tree where the bunch appears on the left side of leaf, the palm is right-handed. The figure shows the 2 kinds of palms. On the basis of limited data relating to only 205 progeny of 4 pollen parents and 24 seed parents, Davis[2] reported that the direction of foliar spiral in the coconut is not determined genetically. At the research farms of the Industrial Crops Research Institute, Manado, there are large collections of parent palms and their progeny raised through different kinds of pollination. Some 25 years ago, A.F. Ihne and his colleagues effected controlled cross pollination between 41 selected palms (now about 52 years old) at the Mapanget Farm involving 49 parent-combinations. The foliar spirals of all the parents and the surviving 1023 progeny (now about 22 years old) at the Kima Atas Farm were checked and the data given in table 1.

As seen from the data in the table 1, 53.96% of the total progeny are left-spiralled. When we look for an association

Table 1. *Cocos nucifera:* Foliar spiralities of parents and progeny

Parent-combinations	No. of combinations	Progeny Lefts	Rights	(L+R)	(L−R)
Left ♀ × left ♂	14	156	164	320	−8
Left ♀ × right ♂	13	150	130	280	20
Right ♀ × left ♂	10	131	89	220	42
Right ♀ × right ♂	12	115	88	203	27
Total	49	552	471	1023	81

between segregation of progeny and parental mating type, we get an overall $\chi^2 = 6.41$ with 3 d.f. which is not statistically significant. However, the numerical superiority of left-handed progeny brought about mainly by the right × left parental matings where the difference between the 2 kinds of progeny is significant, the χ^2-value at 1 d.f. turning out to be 8.01. An explanation is being sought for this peculiarity.

Also from the 41 parent palms mentioned above, over a thousand open-pollinated progeny were obtained and planted at the Kayuwatu Farm, Manado. Data obtained on 570 progeny of 19 seed parents are given in table 2.

It is clear from the data given in table 2 that both the left-spiralled and right-spiralled mothers produce equal numbers of the 2 kinds of progeny nullifying any genetic influence controlling the asymmetry. At the Mapanget Farm, Manado, there are 3 palms (about 45 years old) which are the only survivors out of many progeny obtained by selfing some palms in private gardens around Manado. These 3 palms were again selfed and the F2 progeny planted at the Kima Atas Farm in 3 plots. The leaf spirals of the 41 survivors were examined and the data presented in table 3.

The difference between the 2 kinds of progeny is not significant statistically, the χ^2-value being 0.2195. This further shows that the foliar spirality is not genetically determined.

There is another sure way of checking whether the direction of coconut foliar spiral has genetical bearing. Exceptional coconuts produce aerial branches or suckers, and so, all the shoots of one such palm should have the same kind of foliar spiral if this character is genetic. Examination of a few such branching palms prove it otherwise, since all the shoots of the same are not similar. Production of bulbil-shoots is a rare phenomenon in the coconut. Recently Sudasrip et al.[10] reported on 2 bulbil-producing coconut palms in Manado. Some of these bulbils were air-layered and transplanted in the field as clones. The spirality of these shoots was recorded and the data are shown in table 4.

Each mother palm produced bulbils which show the 2 kinds of asymmetry. This confirms that the direction of foliar spirals in the coconut is not genetically determined.

We made a sample survey of palms at the hybrid seed garden at Paniki and in other farms of this Institute covering 7860 palms for their foliar spirals. The data are presented in table 5.

With the exception of the Talls at Paniki, the populations in all the Farms have an excess of left-spiralled palms over the counterpart. This situation is similar to that reported by Davis[11].

Since the leaves are arranged spirally on the crown, the lamina should turn asymmetric resulting in a difference in the numbers of leaflets between halves of the same leaf. To

Table 2. *Cocos nucifera:* Foliar spiralities of seed parents and open-pollinated progeny

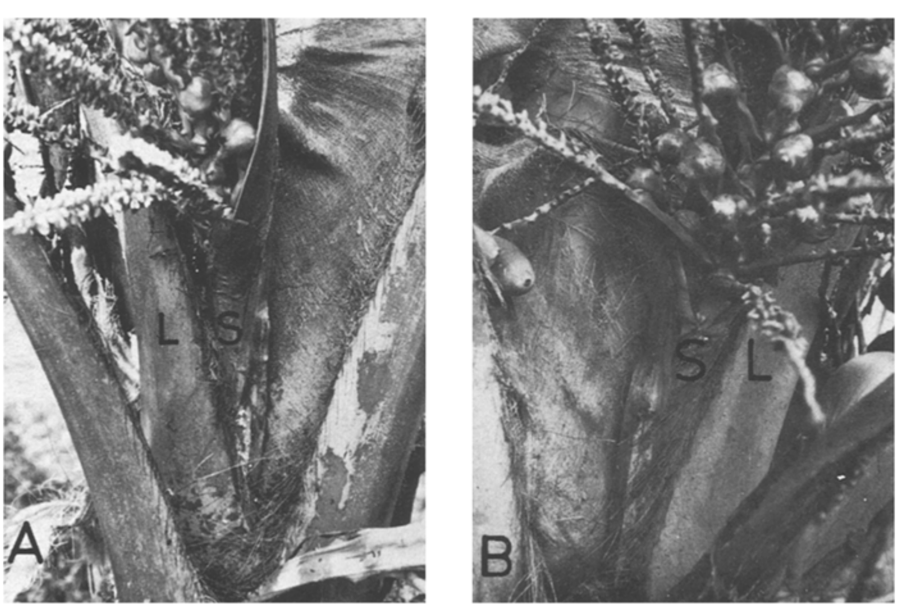
Seed parents	No. of palms	Handedness of progeny Lefts	Rights	Total
Left-spiralled	5	78	72	150
Right-spiralled	14	208	212	420
Total	19	286	284	570

Table 3. *Cocos nucifera:* Foliar spiralities of mother palms and selfed progeny

Seed parent	Foliar spiral	Handedness of selfed progeny Lefts	Rights	Total
G1: 32/37	Left-spiralled	4	2	6
G2: 10/37	Left-spiralled	15	13	28
G3: 77/37	Right-spiralled	3	4	7
Total		22	19	41

Table 4. *Cocos nucifera:* Spirality of bulbil-shoots and that of mother palms

Mother palm	Spirality	Bulbil-shoots Lefts	Rights	Total
No. 1037	Left	6	4	10
No. 1586	Right	6	5	11
Total		12	9	21



Closer view of crowns of left-handed (A) and right-handed coconuts. In a left-handed palm, the spadix (S) emerges on the right side of the supporting leaf (L), and in a right-handed palm, the spadix appears on the left side of the leaf.

Table 5. *Cocos nucifera:* Left- and right-spiralled palms at LPTI Farms, Manado

Location	Spirality of palms Lefts	Rights	(L+R)	(L−R)	$\frac{(L-R)^2}{L+R}$
Paniki seed garden:					
Talls	1293	1331	2624	−38	0.5503
Dwarf	1544	1415	2959	129	5.6239
Kima Atas - Talls	552	471	1023	81	6.4135
Mapanget - Talls	372	312	684	60	5.2632
Kayuwatu - Talls	286	284	570	2	0.0070
Total	4047	3813	7860	234	6.9664

Table 6. *Cocos nucifera:* Numbers of leaflets on halves of leaves

No. of Palms	Spiral	No. of leaves	Mean length of lamina	Longest leaflets Left	Right	Mean leaflets on halves Left	Right	Total	Difference
6	Left	36	4.28 m	1.37 m	1.37 m	118.94	116.95	235.99	1.99
6	Right	36	4.39 m	1.34 m	1.37 m	117.14	120.03	237.17	2.89

verify this, 6 leaves each from 6 left-spiralled and 6 right-spiralled palms were lopped and the numbers of leaflets on halves counted. To determine the left and right halves, the leaves are always held vertically with the tip above. The left-hand side of the leaf as it appears to an observer viewing the abaxial surface (lower) is regarded as left half, and the other, the right half. The data are presented in table 6.

When the 5 spirals are considered, in a left-spiralled palm the left half of the leaf bears more leaflets than the right half, and similarly, the right half bears more leaflets in a leaf of a right-spiralled palm.

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The effect of acidic polysaccharides and prostaglandin-like substances isolated from *Propionibacterium acnes* on granulocyte chemotaxis

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Summary. Three acidic polysaccharide (AP) fractions and the prostaglandin-like substances (PLS) isolated from *P. acnes* were investigated regarding their chemotactic activities on polymorphonuclear leukocytes. Both AP's and PLS induced a significant chemotactic response, which suggests their involvement in inflammatory acne vulgaris.

Chemotactic agents released within the comedones have been suggested to contribute to the inflammatory reactions in acne vulgaris. It has been well established that *Propionibacterium acnes* are the most important organisms present in the complex comedone microflora, and furthermore, that the whole bacteria are chemotactic for human polymorphonuclear leukocytes[1].

Earlier investigators have maintained that the bacterial lipase is the prime chemotactic factor in *P. acnes* culture supernatants[2]. This has, however been contradicted by Puhvel and Sakamoto[3], who studied different chemotactic preparations of *P. acnes* (i.e. whole cell suspensions, soluble lipopolysaccharides, fresh culture supernatants, and extracellular products obtained from dialyzed cultures) as well as other comedonal components. They found the highest cytotaxin activity to be present in the undialyzed culture supernatants. The lipopolysaccharides did not exhibit a significant chemotactic activity in the concentrations tested. However, all chemotactic activity in comedones was related to bacteria. Both *P. acnes* and its extracellular products were effective as cytotaxigens.

The purpose of the present investigation is to increase our understanding of the chemoattractant properties of *P. acnes.* We evaluated the leukocyte chemotactic response called forth by three acidic polysaccharide (AP) fractions of *P. acnes,* and the prostaglandin-like substances (PLS) extracted from lipid moieties of the bacterial cells.

The AP fractions as well as the PLS were isolated from *P. acnes.* The AP's are released from the cell wall during growth. They can be separated as 3 molecular entities by