

TENTATIVE LIST OF VIRUSES REPORTED FROM NATURALLY INFECTED LEGUMINOUS PLANTS¹

L. BOS

Institute of Phytopathological Research (I.P.O.), Wageningen

Attention is pointed to the problem of communication in plant pathology resulting from inadequate identification, description, and the lack of any accepted classification for plant viruses. The present paper proposes some standardization in the use of common or vernacular virus names and gives an alphabetical list of viruses reported from naturally infected leguminous plants. The list was prepared with help of the International Working Group on Legume Viruses.

INTRODUCTION

Identification and characterization of viruses and virus diseases has been a problem in plant pathology since 1927. To enable a more valid comparison among diseases and viruses reported from different countries on legumes, BOS, HAGEDORN & QUANTZ (1960) suggested the standardization of procedures for international identification of the viruses concerned. As a consequence virologists and plant pathologists in several countries established the International Working Group on Legume Viruses in 1962 for the exchange of seeds of test plants, antisera, and information. It now has 44 members actively engaged in research on these viruses.²

The Group suggested that one of its initial tasks was to compile a tentative list of viruses reported from naturally infected leguminous plants. Such a list in addition to serving as an inventory of the viruses may help achieve some standardization in their nomenclature, and help facilitate recognition by referring to the literature pertaining to their identification. To some extent this endeavour is a continuation of earlier work by WEISS (1939, 1945). The present compilation originated from an unpublished list submitted by Dr. G. ROLAND and co-workers, Gembloux, Belgium, to the first meeting of the Group at Brussels in September 1962 during the 16th International Horticultural Congress. That list contained the names of all viruses reported to be infectious to leguminous plants. At the meeting it was suggested that the present author make a selection of those viruses known to infect legumes naturally. Detailed references to the literature were added. The mimeographed manuscript was sent to members of the Group, and to virologists who had worked on one or more of the viruses included, for their suggestions and comments.

In view of the insufficient information on intrinsic virus properties to allow a satisfactory "Linnaean" classification (Bos, 1963), this list is an alphabetical catalogue. It is hoped that it will stimulate further compilation of data on the pertinent viruses, in order to provide a basis for future scientific classification. Because of the present lack of such a classification, instead of Latin binomials, common or vernacular names will be used only. In view of the wide application

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² The present Steering Committee of the Working Group consists of the three above-mentioned authors, Dr. HAGEDORN, Department of Plant Pathology, University of Wisconsin, Madison, Wisc. U.S.A., being executive secretary.

of English in plant virology, this language seems to be the most acceptable for naming viruses internationally. Virologists in different countries should be responsible for justified translations in their own language.

In selecting the most appropriate common name, priority is given to the oldest publication (mentioned in the list under A) demonstrating the virus nature of the disease, except in those cases where their use leads to a confusion (cf. the indication *nomen rejiciendum* in botanical nomenclature). If confusion should arise, when for the sake of priority preference was given to the oldest name in spite of the fact that a more recent one is commonly used, the oldest name has to be rejected and the recent one conserved (cf. *nomen conservandum*). In such cases the reasons are stated under Comments.

The identity of a given virus is established only when such intrinsic properties as serology, morphology and size, and chemical and physical properties are known (the publications concerned are given under B). In some cases it is difficult to conclude which paper exactly established the identity of the virus, for sometimes, such as with tobacco mosaic virus, a series of publications are involved. For many other viruses sufficient work has not been completed for positive identification. Sometimes certain biological characters, e.g. beetle transmission, are helpful in identification.

Thus names, given in old publications without an accurate description of the virus involved, should be considered doubtful (cf. the indication *nomen nudum*), unless additional work on the same virus isolate substantiates the original identification. One of the aims of this list is to draw attention to viruses that need further work for positive identification. For this reason the conservation of type-material, preferably in desiccated tissue, of newly described viruses is essential.

Undoubtedly the number of viruses will decrease with additional work on identification, as is the case in mycology with the *Fungi imperfecti*.

To avoid further confusion new names (*nomina nova*) should be introduced only on the basis of a careful study of the intrinsic properties of the viruses concerned; and editors of Journals should be aware of this responsibility. Unfortunately, for the time being, this restriction can be made only to viruses that are sap-transmissible.

An important rule in botanical nomenclature, which should have more attention in this regard, is that new botanical names are only considered legal if the descriptions of the new entities concerned are published in an officially accepted journal and if the identifying description is given in Latin. It might be wise to accept such a rule for plant viruses and to use English as the international language instead of Latin.

Another aspect which needs mentioning here is the natural variation of plant viruses. Without a definition of the species concept for viruses one can keep splitting off new forms as separate viruses. For very definite practical reasons at the present time virologists should tend to be "lumpers" rather than "splitters".

ALPHABETICAL LIST

The publications listed under category A are the first papers demonstrating the virus nature of the diseases concerned. Earlier publications using other names or not giving full proof of its virus nature are put in parentheses. The publications mentioned under B are those establishing the virus identity on the basis of intrinsic properties. If a virus was not originally described from legumes, then the first publication(s) demonstrating natural infection of leguminous plants is (are) mentioned under C.

Only in those cases where synonymy has been revealed recently, synonyms are recorded and listed separately. Names of viruses, of which the identity is rather well established on the basis of intrinsic properties, are printed with an asterisk.

Abutilon mosaic virus

A. (MORREN, Acad. Roy. Belgique 28 sér 2: 434, 1869)

BAUR, Ber. dtsch. bot. Ges. 22: 453, 1904

C. COSTA, Phytopath. Z. 24: 97, 1955 (*Phaseolus vulgaris* (in this plant species described as a virus disease by COSTA & FORSTER, Biológico 7: 177, 1941) and *Glycine max*)

Comments: Although MORREN proved its infectious nature, BAUR was the first to demonstrate the virus nature of the disease.

There is much confusion in the naming of this virus. Originally the disease was named "infectious variegation" (BAUR, 1904: "infektiöse Panaschierung"). Therefore a frequently used German name is "Buntblättrigkeit". In the recent literature the name "Abutilon mosaic virus" is dominating although R.A.M. suppl. 35, 1957, prefers the name "Abutilon infectious variegation virus". Since the name Abutilon mosaic virus is much shorter and can be easily translated into other languages, and the disease is characterized by mosaic, it might be better to continue this name.

Alfalfa dwarf virus

(alfalfa = lucerne = *Medicago sativa*)

A. WEIMER, (Phytopathology 21: 71, 1931); J. agric. Res. 53: 333, 1936

Comments: The virus is identical to that causing "Pierce's (grape) vine disease" (HEWITT *et al.*, 1946). The virus is distinguished by the fact that it is transmitted by xylem-feeding leafhoppers (sharp-shooters).

***Alfalfa mosaic virus**

A. WEIMER, (Phytopathology 21: 132, 1931); Phytopathology 24: 239, 1934

B. ROSS, Phytopathology 31: 394, 1941

BANCROFT & KAESBERG, Biochim. biophys. Acta 39: 519, 1960 (electron microscopy and physical properties)

BANCROFT, MOORHEAD, TUTTE & LIU, Phytopathology 50: 34, 1960 (serology)

Comments: The virus was first described in the U.S.A. as "alfalfa mosaic virus". Members of the International Working Group on Legume Viruses agree that it is preferable to use the American name alfalfa mosaic virus in stead of the English indication lucerne mosaic virus, although in R.A.M. Suppl. 35 the latter name is used. Two suggestions, that for the sake of uniformity in view of the existence of a series of lucerne viruses preference should be given to the name lucerne mosaic virus, are not acceptable. Priority has to be given to the first authentic name, unless this name creates confusion as to the identity of the virus concerned.

Alfalfa witches' broom virus

A. MENZIES, Phytopathology 36: 762, 1946

Comments: According to KUNKEL (Phytopathology 42: 27, 1952) this virus disease, occurring in Western U.S.A. and adjacent Canada, differs symptomatologically from the other yellows-type diseases. However, HELMS (Aust. J. agric. Res. 8: 135, 1957) concludes the North American diseases to be identical to the Australian lucerne witches' broom virus disease, which is considered to be caused by the tomato big bud virus. The relationship of these viruses to other witches' broom or "yellows-type" viruses is not yet known (see comments on aster yellows virus).

Alsike clover mosaic virus

(alsike clover = *Trifolium hybridum*)

A. ZAUMEYER & WADE, J. agric. Res. 51: 715, 1935

Comments: According to WEISS (Plant Dis. Repr., Suppl. 154: 32, 1945) this virus and another related one, designated as alsike clover mosaic virus 2, both resemble bean yellow mosaic virus in some respects.

***Arabis mosaic virus**

A. SMITH & MARKHAM, Phytopathology 34: 324, 1944

B. CADMAN, Virology 11: 653, 1960 (serology)

HARRISON & NIXON, Virology 12: 104, 1960 (electron microscopy)

C. HARRISON, Ann. appl. Biol. 46: 221, 1958 (*Trifolium repens*)

SCHMELZER, Phytopath. Z. 46: 105, 1963 (*Laburnum alpinum*)

Comments: The virus is identical to "raspberry yellow dwarf virus" (CADMAN, 1960) and related to "rhubarb mosaic virus" (SCHADE, Phytopath. Z. 37: 422, 1960).

Asparagus bean mosaic virus

See comments cowpea mosaic virus.

Aster yellows virus

A. KUNKEL, Amer. J. Bot. 13: 646, 1926

C. KUNKEL, U.S.D.A. Yearb. Agric. 1953: 642 (a number of legumes)

Comments: The relationship of aster yellows virus to a series of other leafhopper-borne viruses, such as alfalfa witches' broom virus, bean phyllody virus, black locust brooming virus, clover dwarf virus, clover phyllody virus, clover witches' broom virus, groundnut witches' broom virus, legume little leaf virus, lucerne witches' broom virus, strawberry green petal virus, sunn hemp phyllody virus, tomato big bud virus, and stolbur virus, is not yet understood (see Bos, Meded. LandbHogeschool, Wageningen 57: 1, 1957). As long as no intrinsic properties of these persistent, non-mechanically transmissible viruses can be studied, their relationship will remain obscure. Therefore it is often impossible to conclude whether a newly found virus is identical to one described previously. Since they are mainly characterized by witches' broom phenomena, Bos (1957) brought them together in a group of closely related witches' broom viruses (see also Bos, Symptoms of virus diseases in plants, 1963). There is some difference of opinion as to the correctness of this name. VALENTA (in his publications and personal discussions) favours the name yellows-type diseases mainly since aster yellows was the first described disease of this group. However, the name yellows diseases is also used for aphid-borne virus diseases as e.g. sugarbeet yellows and barley yellow dwarf.

***Bean common mosaic virus**

A. STEWART & REDDICK, (1917); Phytopathology 9: 445, 1919

B. BRANDES & QUANTZ, Naturwissenschaften 42: 588, 1955 (morphology)

BEEMSTER & VAN DER WANT, Antonie van Leeuwenhoek J. Microbiol. Serol. 17: 285, 1951;

BERCKS, Phytopath. Z. 35: 105, 1959 (serology)

Comments: A distant serological relationship exists between the bean common mosaic virus and the bean yellow mosaic virus (BERCKS, Phytopath. Z. 39: 120, 1960) and the soybean mosaic virus (QUANTZ, Phytopath. Z. 43: 79, 1961/62).

The name "common bean mosaic virus" had better be avoided since common is an adjective to mosaic, see e.g. bean yellow mosaic virus, broad bean true mosaic virus, white clover mosaic virus and clover yellow mosaic virus.

Originally STEWART & REDDICK introduced the name "bean mosaic virus". Since PIERCE (Phytopathology 24: 87, 1934) for the sake of distinguishing the virus from that of bean yellow mosaic added the adjective "common", this has been generally used.

Bean leaf wilt virus

A. JOHNSON, J. agric. Res. 64: 443, 1942

Comments: The bean leaf wilt disease was experimentally induced by juice inoculation from symptomless *Lathyrus pusillus*.

Bean phyllody virus

A. DANA, *Phytopathology* 37: 360, 1947

Comments: The virus might be identical to aster yellows virus, but its exact relationship to the witches' broom viruses is not known (see comments on aster yellows virus).

***Bean pod mottle virus**

A. ZAUMEYER & THOMAS, *J. agric. Res.* 77: 81, 1948

B. BANCROFT, *Virology* 16: 419, 1962 (purification and properties)

SCOTT, VINCENT & ZAUMEYER, *Phytopathology* 51: 755, 1961 (serological difference from a series of viruses)

Comments: SHEPHERD (*Phytopathology* 53: 865, 1963) and AGRAWAL & MAAT (*Nature*, Lond. 202: 674, 1964) independently demonstrated a distant serological relationship between bean pod mottle virus and cowpea mosaic virus.

***Bean southern mosaic virus**

A. ZAUMEYER & HARTER, *J. agric. Res.* 67: 305, 1943

B. PRICE, WILLIAMS & WYCKOFF, *Arch. Biochem.* 9: 157, 1946

PRICE & BLACK, *Phytopathology* 36: 157, 1946

Comments: Although ZAUMEYER & HARTER (1943) introduced the name "southern bean mosaic virus" only the name "bean southern mosaic virus", as used by WEISS (*Plant Dis. Reprtr*, Suppl. 154: 32, 1945), is correct. The host plant is bean and not southern bean (cf. also comments on bean common mosaic virus).

In 1960 a "new" bean virus was described by YERKES & PATINO (*Phytopathology* 50: 334, 1960) as the "severe bean mosaic virus". Recently GROGAN & KIMBLE (*Phytopathology* 54: 75, 1964) demonstrated this virus to be closely related to the bean southern mosaic virus. There were only slight differences in symptom expression and host range. The reported differences in electrophoretic mobility were based only on immuno electrophoretic observations. Since there was a strong serological cross reaction between this isolate and the bean southern mosaic virus it seems preferable to consider it as a strain of the latter virus.

Bean western mosaic virus

A. SKOTLAND & BURKE, *Phytopathology* 51: 565, 1961

Comments: The seed-borne virus produces symptoms resembling those produced by bean common mosaic virus, but has a wide host range. The authors preliminary named the virus "Western bean mosaic virus". It should be borne in mind, however, that according to QUANTZ (*Phytopath. Z.* 43: 79, 1961/62) the bean common mosaic virus has a wider host range than was assumed so far.

***Bean yellow mosaic virus**

A. (McLARTY, *Phytopathology* 10: 501, 1920)

PIERCE, *Phytopathology* 24: 87, 1934

B. BEEMSTER & VAN DER WANT, *Antonie van Leeuwenhoek J. Microbiol. Serol.* 17: 285, 1951; BERCKS, *Phytopath. Z.* 39: 120, 1960 (serology)

BRANDES & QUANTZ, *Naturwissenschaften* 42: 588, 1955 (morphology and size)

Comments: Its relationship to pea mosaic virus should be studied further (see also pea mosaic virus). The bean yellow mosaic virus has a distant serological relationship with bean common mosaic virus (BERCKS, *Phytopath. Z.* 35: 105, 1959), beet mosaic virus and potato virus Y (BERCKS, *Virology* 12: 311, 1960; *Phytopath. Z.* 40: 357, 1960/61), soybean mosaic virus (QUANTZ, *Phytopath. Z.* 43: 79, 1961/62), and watermelon mosaic virus (VAN REGENMORTEL, BRANDES & BERCKS, *Phytopath. Z.* 45: 205, 1962).

Although PIERCE (1934) introduced the name "yellow bean mosaic virus", usage of the indication "bean yellow mosaic virus" is common practice. This name is preferable for reasons mentioned under bean common mosaic virus.

Bean yellow stipple virus

A. ZAUMEYER & THOMAS, *Phytopathology* 40: 847, 1950

Beet curly top virus

A. (BALL, U.S.D.A. Bur. Ent. Bull. 66: 33, 1909; BONCQUET & HARTUNG, *Phytopathology* 5: 348, 1915)

CARSNER, *Phytopathology* 9: 413, 1919

- SEVERIN, J. econ. Ent. 12: 312, 1919
 C. CARNSNER, J. agric. Res. 33: 345, 1926 (*Phaseolus vulgaris*)

***Beet mosaic virus**

- A. LIND, Tidsskr. Planteavl 22: 444, 1915
 B. ZIMMER & BRANDES, Phytopath. Z. 26: 439, 1956 (morphology and size)
 BERCKS, Virology 12: 311, 1960; Phytopath. Z. 40: 357, 1960/61 (serology)
 C. BENNETT, Phytopathology 39: 669, 1949 (*Melilotus indicus* and *Trifolium incarnatum*)
 QUANTZ, NachrBl. dtsh. PflSchDienst, Braunschweig 10: 65, 1958 (*Pisum sativum*)
 Comments: According to BERCKS (1960, 1960/61) the virus shows a distant serological relationship to bean yellow mosaic virus and potato virus Y.

Black locust brooming virus

(black locust = *Robinia pseudacacia*)

- A. JACKSON & HARTLEY, Phytopathology 23: 83, 1933
 Comments: The disease belongs to the group of witches' broom virus diseases (see comments on aster yellows virus).

***Broad bean mottle virus**

- A. BAWDEN, CHAUDHURI & KASSANIS, Ann. appl. Biol. 38: 774, 1951
 B. idem
 WETTER, PAUL, BRANDES & QUANTZ, Z. Naturf. 156: 444, 1960
 YAMAZAKI, BANCROFT & KAESBERG, Proc. nat. Acad. Sci., Wash. 47: 979, 1961
 Comments: According to Suppl. R.A.M. 35, 1957, the virus is identical to broad bean true mosaic virus. WETTER, PAUL, BRANDES & QUANTZ, however, demonstrated the two viruses to be different. According to WITTMANN & PAUL (Phytopath. Z. 41: 74, 1961) the viruses are entirely different in their amino-acid constitution.

***Broad bean true mosaic virus**

- A. QUANTZ, Phytopath. Z. 20: 421, 1953
 B. PAUL, BRANDES & QUANTZ, Phytopath. Z. 31: 441, 1958
 Comments: See comments on broad bean mottle virus.

Broad bean vascular wilt virus

- A. STUBBS, J. Dept. Agric. Vict. 45: 323, 1947
 Comments: In R.A.M. (Suppl. 35, 1957) the virus is listed as "broad bean wilt virus". However, STUBBS is speaking of the "vascular wilt" virus disease of broad bean.

Cassia mosaic virus

- A. VAN VELSEN, Pap. N. Guin. agric. J. 14: 124, 1961

***Centrosema mosaic virus**

- A. VAN VELSEN & CROWLEY, Aust. J. agric. Res. 13: 220, 1962
 B. CROWLEY & FRANCKI, Aust. J. biol. Sci. 16: 468, 1963

Clover club leaf virus

- A. BLACK, Proc. Amer. phil. Soc. 88: 132, 1944
 Comments: The virus was only found in leafhoppers naturally infected. It is only recorded here since it was described as a legume virus.

Clover dwarf virus

- A. MUSIL, Biologia Bratislava 15: 721, 1960
 Comments: According to VALENTA & MUSIL (Phytopath. Z. 47: 38, 1963) the virus was originally mistaken for a strain of the stolbur virus. Its relationships to other witches' broom viruses are not yet known (see comments on aster yellows virus).

Clover enation virus

- Comments: The "new leafhopper-borne plant disease" described by MARAMOROSCH (Plant Dis. Reprtr 37: 612, 1953) and listed by K. M. SMITH (Textbook 1953: 176) as "clover enation virus", was only due to toxic effects of leafhopper feeding (cf. EVENHUIS, Proc. 3rd Conf. Potato Virus Dis. 1958: 251; MARAMOROSCH *et al.*, Ent. exp. & appl. 4: 86, 1961).

Clover phyllody virus

See strawberry green petal virus

Clover witches' broom virus

A. FRAZIER & POSNETTE, Ann. appl. Biol. 45: 580, 1957

Comments: The relationship of this virus to other witches' broom viruses is not yet known (see comments aster yellows), although FRAZIER & POSNETTE found differences with several of them.

***Clover yellow mosaic virus**

A. (JOHNSON, Phytopathology 32: 103, 1942; as "pea mottle" virus)

PRATT, Canad. J. Bot. 39: 655, 1961

B. PRATT, Canad. J. Bot. 39: 655, 1961 (serology especially)

PRATT & REICHMANN, Proc. Canad. phytopath. Soc. 28: 13, 1961 (purification and properties)

AGRAWAL, CHESIN & BOS, Nature, Lond. 194: 408, 1962 (purification, electron microscopy)

BERCKS & BRANDES, Phytopath. Z. 47: 381, 1963 (serology and size)

Comments: The name "pea mottle virus" introduced by JOHNSON (1942), is considered incorrect by PRATT (1961) at the suggestion of a number of members of the International Working Group on Legume Viruses. The main reasons are: (1) although JOHNSON (1942) isolated a second virus from mosaic diseased white clover plants, his description of the virus was insufficient (cf. BOS, DELEVIĆ & VAN DER WANT, Tijdschr. PlZiekt. 65: 89, 1959); (2) the pea plant was only used as test plant and differential host. See also white clover mosaic virus, with which it often occurs in complex. BERCKS & BRANDES (1963) demonstrated a distant serological relationship to potato virus X, cactus virus X, Hydrangea ringspot virus, and white clover mosaic virus.

Common bean mosaic virus

See bean common mosaic virus

***Cowpea mosaic virus**

A. (SMITH, Science N.S. 60: 268, 1924)

DALE, Ann. appl. Biol. 36: 327, 1949

B. CHANT, Ann. appl. Biol. 50: 159, 1962

AGRAWAL, Meded. LandbHoges., Wageningen 64 (5): 53 pp., 1964

Comments: Some other cowpea mosaics described as "cowpea mosaic" (McLEAN, Phytopathology 31: 420, 1941; YU, Ann. appl. Biol. 33: 450, 1946; ANDERSON, Plant Dis. Repr 39: 345, 1955; and several Indian publications cf. NARIANI & KANDASWAMY, Indian Phytopath. 14: 77, 1961) and "Asparagus bean mosaic" (SNYDER, Phytopathology 32: 518, 1942; HINO, Ann. phytopath. Soc. Japan 25: 178, 1960) seem to be caused by bean yellow mosaic virus (cf. e.g. CORBETT, Fla. Univ. Agric. Exp. Sta. ann. Rep. 1956: 117). The virus unfortunately called "cowpea mosaic virus" by BRANDES (Mitt. biol. Bundesanst. Land. u. Forstwirtschaft. Berlin Dahlem 110, 1964), without giving a detailed description, is at least related to bean yellow mosaic virus. According to VAN VELSEN (Pap. N. Guin. agric. J. 14: 153, 1962) a cowpea mosaic virus occurring in New Guinea appears to be related to mosaic viruses investigated by McLEAN (1941), SNYDER (1942) and YU (1946).

A distinctive character of the cowpea mosaic virus is its beetle-transmissibility.

Independently, SHEPHERD (Phytopathology 53: 865, 1963) and AGRAWAL & MAAT (Nature, Lond. 202: 674, 1964; see also AGRAWAL, 1964) demonstrated a distant serological relationship between the cowpea mosaic virus and bean pod mottle virus. Similarly the latter authors showed the existence of a serological relationship with the red clover mottle virus.

Crotalaria mosaic virus

(*Crotalaria juncea* = sunn hemp)

A. JOHNSON & LEFEBVRE, Phytopathology 28: 10, 1938

Comments: According to BOS (Meded. LandbHoges., Wageningen 57: 1 (p. 48), 1957) *Crotalaria* mosaic is *not* identical to "*Crotalaria curl*" as suggested by HADIWIDJAJA (Tijdschr. PlZiekt. 58: 1, 1952) and listed by R.A.M. (Suppl. 35, p. 18, 1957). "*Crotalaria curl*" belongs to the group of witches' broom virus diseases (cf. sunn hemp phyllody virus).

Recently in the U.S.A. KAHN *et al.* (Plant Dis. Repr 47: 364, 1963) demonstrated bean yellow mosaic virus as the incitant of a yellow mosaic disease of sunn hemp.

Crotalaria smalling virus

See comments sunn hemp phyllody virus

***Cucumber mosaic virus**

A. DOOLITTLE, *Phytopathology* 6: 145, 1916; U.S.D.A. Bull. 879: 69 pp., 1920

B. TOMLINSON, SHEPHERD & WALKER, *Phytopathology* 49: 293, 1959 (purification, electron microscopy)

SCOTT, *Virology* 20: 103, 1963 (purification, electron microscopy)

C. KÖHLER, *NachrBl. dtsh. PflSchDienst, Braunschweig* 15: 90, 1935 (*Lupinus luteus*)

MCLEAN, *Phytopathology* 31: 420, 1941 (*Vigna sinensis*)

WHIPPLE & WALKER, *J. agric. Res.* 62: 27, 1941 (*Pisum sativum* and *Phaseolus vulgaris*)

Dolichos enation mosaic virus

See tobacco mosaic virus

Dolichos lablab yellow mosaic virus

A. CAPOOR & VARMA, *Curr. Sci.* 19: 248, 1950

Comments: The virus is white-fly-transmitted.

Double bean yellow mosaic virus

(double bean = *Phaseolus lunatus*)

A. CAPOOR & VARMA, *Curr. Sci.* 17: 152, 1948

Comments: R.A.M. (Suppl. 35, 1957) erroneously listed this virus as "bean double yellow mosaic virus". The virus causes mosaic in double bean (see also comments on bean common mosaic virus). According to BIRD (*Phytopathology* 52: 286, 1962) a virus causing mosaic in *Rhynchosia minima* in Puerto Rico seems to be related to the white-fly-transmitted double bean yellow mosaic virus. In tobacco he found the symptoms to be indistinguishable from those of tobacco leaf curl.

Groundnut marginal chlorosis virus

(groundnut = *Arachis hypogaea*)

A. VAN VELSEN, *Pap. N. Guin. agric. J.* 14: 38, 1961

Comments: The virus could only be transmitted through seed and by grafting.

Groundnut mosaic virus

A. THUNG, *Landbouw* 19: 337, 1947

BERGMAN, *Tijdschr. PZiekt.* 62: 291, 1956

Comments: According to BERGMAN (1956) the virus is leafhopper-borne.

Groundnut rosette virus

A. STOREY & BOTTOMLEY, (*Nature, Lond.* 2907: 97, 1923); *Ann. appl. Biol.* 15: 26, 1928

Comments: ZIMMERMANN (*Pflanzer* 3: 129, 1907) for the first time described the disease under the name "Kräuselkrankheit" (curl disease) without demonstrating its cause.

According to VERHOYEN (*Parasitica* 19: 95, 1960; more details in *Thesis Ing. Agron. Univ. Cathol. Louvain* 1959: 173 pp. (mimeogr.)), the "groundnut fleck virus", the "groundnut green rosette virus" and the "groundnut vein banding virus", described by NEVELING (*Fmg in S. Afr.* 29, 124 pp., 1954) and listed in R.A.M. Suppl. 35, 1957, as separate viruses, have to be considered as nothing but symptomatological forms of the groundnut rosette virus. If this is true, the three names have to be considered as *nomina nuda*.

Groundnut witches' broom virus

A. THUNG, *Landbouw* 19: 337, 1947

Comments: This virus described in Indonesia presumably is responsible for witches' broom symptoms in several tropical crops grown in that country. The disease is closely related to, if not identical to a number of other tropical witches' broom virus diseases, such as "phyllody of sunn hemp" (see sunn hemp phyllody virus) and "curl and witches' broom of *Crotalaria*" (THUNG & HADIWIDJAJA, *Tijdschr. PZiekt.* 56: 349, 1950; HADIWIDJAJA, *Tijdschr. PZiekt.* 58: 1, 1952). For a discussion of these and other witches' broom virus diseases see Bos (*Meded. LandbHogesch., Wageningen* 57: 1, 1957). See also the comments on aster yellows virus.

Laburnum mosaic virus

A. MASTERS, *Gdnrs' Chron.* 7: 730, 1877

BAUR, *Ber. dtsh. bot. Ges.* 24: 416, 1906; 25: 150, 1907

Comments: SCHMELZER (Phytopath. Z. 46: 105, 1963) succeeded in isolating *Arabis* mosaic virus from a chlorotic *Laburnum alpinum* var. *aureum*. Attempts to transmit *Laburnum* mosaic virus mechanically were unsuccessful so far. There exists quite some divergency in the naming of this virus. BAUR (1906) introduced the name "infectious chlorosis". Later on ATANASOFF (Phytopath. Z. 8: 197, 1935) used the name "infectious variegation". Therefore R.A.M. (35, 1957) spoke of "*Laburnum* infectious variegation virus", whereas SMITH (Textbook, 1957) used the name "*Laburnum* mosaic virus". Since the latter name is already often used, is shorter, and easier to be translated into other languages, it seems preferable to stick to this name.

Legume little leaf virus

A. HUTTON & GRYLLS, Aust. J. agric. Res. 7: 85, 1956

Comments: This leafhopper-transmitted virus seems to be related to groundnut witches' broom virus (cf. Bos, Meded. LandbHogeschool, Wageningen 57: 1, 1957), but its exact identity is not known (see comments aster yellows virus).

***Lettuce mosaic virus**

A. JAGGER, J. agric. Res. 20: 737, 1921

AINSWORTH & OGILVIE, Ann. appl. Biol. 26: 279, 1939

B. COUCH & GOLD, Phytopathology 44: 715, 1954 (morphology only)

TOMLINSON, Nature, Lond. 193: 299, 1962 (purification, serology and morphology)

C. AINSWORTH & OGILVIE (1939) (*Lathyrus odoratus* and *Pisum sativum*)

Comments: According to BARTELS (as reported by BRANDES, Mitt. Biol. Bundesanst. Land-Forstwirtschaft, Berlin Dahlem 110, 1964) serological tests showed a distant relationship of the virus to potato virus Y.

Lucerne papillosity virus

A. BLATTNÝ, Fol. Microbiol. 4: 212, 1959

Lucerne witches' broom virus

A. EDWARDS, J. Aust. Inst. agric. Sci. 1: 31, 1935; Sci. Bull. Dep. Agric. N.S.W. 52, 1936

Comments: The relationships of this virus to other witches' broom viruses is not yet known. HELMS (Aust. J. agric. Res. 8: 135, 1957) considers the virus to be identical to the North American alfalfa witches' broom and to the tomato big bud virus. See also comments on aster yellows virus.

Mung bean yellow mosaic virus

(mung bean = *Phaseolus aureus*)

A. NARIANI, Indian Phytopath. 13: 24, 1960

Comments: This white-fly-transmitted virus differs from the white-fly-transmitted *Dolichos lablab* yellow mosaic virus and double bean yellow mosaic virus especially in its inability to infect *Dolichos lablab* and *Phaseolus lunatus* (= double bean).

***Pea early browning virus**

A. BOS & VAN DER WANT, Tijdschr. PlZiekt. 61: 368, 1962

B. idem (properties, e.g. morphology and size)

MAAT, Tijdschr. PlZiekt. 69: 287, 1963 (serology)

Comments: The virus shows a distant serological relationship to the tobacco rattle virus

Pea enation mosaic virus

A. OSBORN, Phytopathology 25: 160, 1935

STUBBS, (Phytopathology 26: 108, 1936); Phytopathology 27: 242, 1937

Comments: Although OSBORN gave a detailed description of the symptoms, PIERCE (J. agric. Res. 51: 1017, 1935) was the first to use the name "enation mosaic virus" in an official publication. The name was introduced, however, by STUBBS in an unpublished manuscript in 1935 (Ph. D. thesis Univ. Wisc. 1935). Official descriptions by STUBBS appeared in 1936 and 1937.

Pea leaf roll virus

A. QUANTZ & VÖLK, NachrBl. dtsch. PflSchDienst, Braunschweig 6: 177, 1954

Comments: Some confusion exists concerning the proper names of disease and virus. The name "Blattroll" (leaf roll) was used by QUANTZ & VÖLK (1954) especially since the disease

of broad bean and pea, of which they were the first to demonstrate the virus nature, presumably had been described by BÖNING (1927) in broad bean under the name "Blattrollkrankheit der Ackerbohne". Although these authors claimed that in peas the disease is mainly characterized by yellowing, they stuck to the name "Blattroll" of broad bean and pea. Inconsequently they introduced the name *Viciavirus chlorogenum* (= yellow making broad bean virus) for the virus.

In an almost simultaneous Dutch publication, HUBBELING (1954) named the disease "topvergelgeling van de erwt" ("pea top yellows"). The paper by DE FLUITER & HUBBELING (1955) was the first to use an English name: "top yellows of peas". In Belgium the disease was reported by ROLAND (1955) as "jaunisse du pois". Consequently K. M. SMITH (Textbook, 1957, p. 333) listed the disease as "pea tip yellowing".

In R.A.M. Suppl. 35, 1957, however, the English translation "pea leaf roll virus" was introduced as official name. Subsequently this name was used by TINSLEY (1959) in the first report on the occurrence of the disease in England. Therefore at present British virologists seem to prefer the name "pea leaf roll", although the name "top yellows" is by far more descriptive. There are definite arguments for both names now, as well as for the name "broad bean leaf roll virus". However, to avoid further confusion it might be wise to give preference to the name "pea leaf roll virus", especially for the sake of priority. This name not necessarily interferes with the Dutch name "topvergelgelingvirus van de erwt" and the French name "jaunisse apicale du pois".

Pea mosaic virus

A. DOOLITTLE & JONES, *Phytopathology* 15: 763, 1935

B. GOODCHILD, *Aust. J. biol. Sci.* 9: 231, 1956 (serology)

BERCKS, *Phytopath. Z.* 39: 120, 1960 (serology)

BRANDES, *Mitt. Biol. Bundesanst. Land-Forstwirtschaft.* 110: 130 pp., 1964 (morphology and size)

Comments: In the literature there exists much confusion on the exact identity of the incitants of several pea mosaics. Many of them have to be considered as bean yellow mosaic virus. GOODCHILD (1956) was the first to find a serological relationship between a "pea mosaic virus" and bean yellow mosaic virus. BERCKS (1960) demonstrated a close serological relationship between a German pea mosaic virus and some strains of bean yellow mosaic virus, and found a distant serological relationship to bean common mosaic virus. The German pea mosaic virus was differentiated especially on its inability to infect *Phaseolus vulgaris*. The problem, whether pea mosaic virus has to be considered as a strain of bean yellow mosaic virus or as a separate virus, has to be studied further.

Pea mottle virus

See clover yellow mosaic virus

Pea streak viruses:

1. *Pea streak virus

A. ZAUMEYER, *J. agric. Res.* 56: 477, 1938

B. BRANDES & QUANTZ, *Arch. Mikrobiol.* 26: 369, 1957; WETTER, QUANTZ & BRANDES, *Phytopath. Z.* 44: 151, 1962 (morphology and size)

WETTER & QUANTZ, *Phytopath. Z.* 33: 430, 1958 (serology)

ROSENKRANZ & HAGEDORN, *Phytopathology* 53: 887, 1963 (also ROSENKRANZ, *Diss. Abstr. Univ. Microf. Inc. Ann. Arbor Mich.* 22: 704, 1961)

2. New Zealand pea streak virus

A. CHAMBERLAIN, *N.Z.J. Sci. Tech. Sect. A.* 20: 365, 1939

3. M.S. pea streak virus

A. KIM & HAGEDORN, *Phytopathology* 49: 656, 1959

4. P.O. pea streak virus

A. KIM & HAGEDORN, *Phytopathology* 49: 656, 1959

Comments: Biological, serological and electron microscope investigations on the German "Steinkleevirus" (BRANDES & QUANTZ, 1957), the Idaho strain (ZAUMEYER & PATINO, *Plant Dis. Repr.* 43: 698, 1959) of the pea streak virus, and the I.5 isolate (KIM & HAGEDORN, 1959) of the "Wisconsin pea streak virus" (HAGEDORN & WALKER, *Phytopathology* 39: 837, 1949) by WETTER & QUANTZ (1958) and WETTER, QUANTZ & BRANDES (1962) led to the conclusion that these three viruses are identical. Therefore the name "Wisconsin pea streak virus" should be considered a synonym of pea streak virus.

According to WETTER *et al.* (1962) the virus is distantly serologically related to the red clover vein mosaic virus.

The exact identity of the other three "pea streak" viruses has not been studied. FRY (personal communication) has not been successful in rediscovering the New Zealand pea streak virus, although he searched for several years. Thus this name may have to be considered as a *nomen nudum*.

It should be borne in mind that several other viruses, such as e.g. alfalfa mosaic virus, beet mosaic virus, pea early browning virus, and tomato spotted wilt virus, are able to induce necrotic streak symptoms in pea plants.

Pea wilt virus

See white clover mosaic virus

Pigeon pea pale mosaic virus

(pigeon pea = *Cajanus indicus*)

A. NEWTON & PEIRIS, FAO Plant Prot. Bull. 2: 17, 1953

Comments: Hardly any description is given by the authors.

Pigeon pea sterility mosaic virus

A. CAPOOR, Indian J. agric. Sci. 22: 271, 1952

Comments: According to KANDASWAMY & RAMAKRISHNAN (Madras agric. J. 47: 440, 1960) the "Cajanus sterility mosaic virus" described by these authors is the same as the sterility mosaic virus of pigeon pea, described by CAPOOR.

SETH (Indian Phytopath. 15: 225, 1962) found the virus to be mite-transmissible.

Pigeon pea yellow mosaic virus

A. NEWTON & PEIRIS, FAO Plant Prot. Bull. 2: 17, 1953

Comments: Hardly any description is given by the authors.

***Potato yellow dwarf virus**

A. (BARRUS & CHUPP, 1922); BLACK, Amer. Potato J. 11: 148, 1934

B. BRAKKE, MOSLEY & WYCKOFF, Biochim. biophys. Acta 2: 121, 1948 (electron microscopy)

BRAKKE, BLACK & WYCKOFF, Amer. J. Bot. 38: 332, 1951 (sedimentation rate)

C. BLACK, Mem. Cornell agric. Exp. Sta. 209: 23 pp., 1937 (very likely in *Trifolium pratense*)

***Red clover mottle virus**

A. SINHA, Ann. appl. Biol. 48: 742, 1960

B. idem

Comments: In serological tests AGRAWAL & MAAT (Nature, Lond. 202: 674, 1964) found the virus to be distantly related to cowpea mosaic virus.

***Red clover vein mosaic virus**

A. OSBORN, Phytopathology 27: 1051, 1937

B. HAGEDORN, BOS & VAN DER WANT, Tijdschr. PlZiekt. 65: 13, 1959

WETTER, QUANTZ & BRANDES, Phytopath. Z. 35: 201, 1959

Comments: The virus is identical to that, causing "pea stunt" described by HAGEDORN & WALKER (1949) (HAGEDORN & HANSON, 1951).

According to WETTER, QUANTZ & BRANDES (Phytopath. Z. 44: 151, 1962) the virus shows a distant serological relationship to the pea streak virus, with which it differs slightly in particle length.

Robinia brooming virus

See black locust brooming virus

Rugose leaf curl virus

A. GRYLLS, Aust. J. Biol. Sci. 7: 47, 1954

C. GRYLLS, J. Aust. Inst. agric. Sci. 21: 187, 1955 (*Trifolium pratense*)

Comments: This virus was detected by GRYLLS (1954) in naturally infected leafhoppers (*Austroagallia torrida*). It is transovarially transmitted in this vector.

Severe bean mosaic virus

See bean southern mosaic virus

Southern bean mosaic virus

See bean southern mosaic virus

***Soybean mosaic virus**

A. GARDNER & KENDRICK, J. agric. Res. 22: 111, 1921

B. QUANTZ, Phytopath. Z. 43: 79, 1961/62 (morphology only)

BERCKS, quoted by QUANTZ (1961/62) (serology)

GALVEZ, Phytopathology 53: 388, 1963 (morphology and purification)

Comments: According to QUANTZ the virus is closely related to the bean common mosaic virus. These relationships should be studied further. Data on virus size obtained by QUANTZ and GALVEZ differ slightly.

BERCKS (quoted by QUANTZ, 1961/62) found a distant serological relationship between the soybean mosaic virus and bean yellow mosaic virus and bean common mosaic virus.

Stolbur virus

A. (KOSTOFF, 1933); RISCHKOV, KARATCHEVSKY & MICHAILONA, Z. Pflanzenkrankh. 43: 496, 1933 (for a detailed recent publication see VALENTA, MUSIL & MIŠIGA, Phytopath. Z. 42: 1, 1961)

C. POSNETTE & ELLENBERGER, Ann. appl. Biol. 51: 69, 1963 (*Trifolium repens*)

Comments: Although the disease was known in Russia as stolbur of tomato and tobacco, RISCHKOV *et al.* originally named the virus "fruit woodiness" virus. Later it became known that the "female sterility" virus of tobacco, reported somewhat earlier by KOSTOFF (Phytopath. Z. 5: 593, 1933), is identical to stolbur virus. Thus that name should have priority. For practical reasons, since the name stolbur virus gradually was generally accepted, the latter name should be conserved (*nomen conservandum*), however, and the other two rejected. The relationship of this virus to that of tomato big bud and to other witches' broom viruses is not yet understood (see also comments aster yellows virus).

According to VALENTA (personal communication) there is some uncertainty as to whether the stolbur virus, isolated in England from white clover by POSNETTE & ELLENBERGER, is identical to that which occurs in Central and Eastern Europe.

Strawberry green petal virus

A. POSNETTE, Plant Pathol. 2: 17, 1953

C. FRAZIER & POSNETTE, Ann. appl. Biol. 45: 580, 1957 (*Trifolium pratense* and *T. repens*)

Comments: This leafhopper-borne virus is identical to clover virescence (or phyllody) (FRAZIER & POSNETTE, 1957). Its relationship to other witches' broom viruses, especially to those causing virescence in clovers, is not yet known (see comments aster yellows virus).

Subterranean clover mosaic virus

(subterranean clover = *Trifolium subterranea*)

A. AITKEN & GRIEVE, J. Aust. Inst. agric. Sci. 9: 81, 1943

Subterranean clover stunt virus

A. GRYLLE & BUTLER, J. Aust. Inst. agric. Sci. 22: 73, 1956; Aust. J. agric. Res. 10: 145, 1959

Comments: The virus is transmitted by aphids in a persistent way.

Sunn hemp phyllody virus

(sunn hemp = *Crotalaria juncea*)

A. BOSE & MISRA, Indian J. agric. Sci. 8: 417, 1938

Comments: The disease seems identical to "curl and witches' broom of *Crotalaria*" described in Indonesia by THUNG & HADIWIDJAJA (Tijdschr. PlZiekt. 56: 349, 1950) and HADIWIDJAJA (Tijdschr. PlZiekt. 58: 1, 1952) and to groundnut witches' broom virus as discussed by Bos (Meded. LandbHoges., Wageningen, 57 (1): 79 pp., 1957). Its exact relationship to other witches' broom viruses is not known (see comments aster yellows virus).

According to NARIANI (1964, verbal communication) the "*Crotalaria* smalling virus" (ANONYMUS, Sci. Rep. Indian Agric. Res. Inst. N. Delhi 1947-1948, 1950 (?)) is nothing but sunn hemp phyllody virus.

***Tobacco mosaic virus**

A. (MAYER, Landw. Versuchssta. 32: 450, 1886)

ALLARD, Bull. U.S. Dept. Agric. 40: 1, 1914

B. a.o. STANLEY, Science 81: 644, 1935

C. LISTER & THRESH, Nature, Lond. 175: 1047, 1955 and BAWDEN, J. gen. Microbiol. 18: 751, 1958 (*Vigna unguiculata* and *Mucuna aterrima*)

CAPOOR, Phytopathology 52: 393, 1962 (*Crotalaria juncea*: "Southern sunn hemp mosaic virus")

BADAMI, Curr. Sci. 28: 481, 1959; Bull. Nat. Inst. Sci. India 24, 1963 (*Dolichos lablab*: "Dolichos enation mosaic virus")

Comments: According to BRANDES (Mitt. Biol. Bundesanst. Land-Forstwirtschaft. Berlin-Dahlem 110: 130 pp., 1964) the virus, originally isolated from cowpea and studied by BAWDEN (1958), should be considered as a distinct virus, which he names "Bawden's cowpea virus". He refers to unpublished results of WETTER, who found a distant serological relationship to tobacco mosaic virus and Odontoglossum ringspot virus. This preliminary note needs further confirmation.

BADAMI (Curr. Sci. 28: 481, 1959; Nat. Inst. Sci. India, Bull. 24, 1963) found the Dolichos enation mosaic virus, described on its biological properties by CAPOOR & VARMA (Curr. Sci. 17: 57, 1948), to be serologically related to "Bawden's cowpea mosaic virus". Thus, the Dolichos enation mosaic virus is considered as a strain of tobacco mosaic virus.

***Tobacco necrosis virus**

A. SMITH & BALD, Parasitology 27: 231, 1935

B. BAWDEN, Brit. J. exp. Path. 22: 59, 1941 (serology)

BAWDEN & PIRIE, Brit. J. exp. Path. 23: 314, 1942; 26: 277, 1945 (purification)

BAWDEN & VAN DER WANT, Tijdschr. PlZiekt. 55: 142, 1949 (electron microscopy)

C. (HUBBELING, Tijdschr. PlZiekt. 48: 225, 1942); VAN DER WANT, Tijdschr. PlZiekt. 54: 85, 1948 (in *Phaseolus vulgaris*: "bean stipple streak")

Comments: Originally BAWDEN (1941) found that some serologically unrelated tobacco necrosis viruses exist. Recently BABOS & KASSANIS (J. gen. Microbiol. 32: 135, 1963) grouped seven tobacco necrosis virus isolates into two viruses, showing a distant serological relationship.

***Tobacco ringspot virus**

A. FROMME, WINGARD & PRIODE, Phytopathology 17: 321, 1927

B. STANLEY, J. biol. Chem. 129: 405, 1939

STEERE, Phytopathology 46: 60, 1956

C. SAMSON, Plant Dis. Repr 26: 382, 1942; ALLINGTON, Phytopathology 36: 319, 1946 (in *Glycine soja*: "soybean bud blight")

***Tobacco streak virus**

A. JOHNSON, Phytopathology 26: 285, 1936

B. SCOTT, VINCENT & ZAUMEYER, Phytopathology 51: 755, 1961 (partial purification and serology of the "bean red node virus", see below)

C. FULTON, Phytopathology 38: 421, 1948 (*Trifolium repens*)

ZAUMEYER, Phytopathology 49: 555, 1959 (*Medicago sativa*)

THOMAS & ZAUMEYER, Phytopathology 40: 832, 1950 (in *Phaseolus vulgaris*: "bean red node")

Tomato big bud virus

A. SAMUEL, BALD & EARDLEY, Phytopathology 23: 641, 1933

C. HILL, J. Coun. sci. industr. Res. Aust. 16: 85, 1943 (a.o. *Trifolium repens* and *T. pratense*)

Comments: Although the disease closely resembles (tomato) stolbur, their identity is not certain. HELMS (Aust. J. agric. Res. 8: 135, 1957) considered the Australian lucerne witches' broom (cf. lucerne witches' broom virus) to be caused by tomato big bud virus. The exact relationships of this virus to other witches' broom viruses is not yet known (see comments aster yellows virus).

***Tomato black ring virus**

A. SMITH, Parasitology 37: 126, 1946

B. HARRISON, J. gen. Microbiol. 18: 450, 1958 (serology)

HARRISON & NIXON, Virology 12: 104, 1960 (purification, morphology, sedimentation constant)

C. QUANTZ, Phytopath. Z. 23: 209, 1955 (*Phaseolus vulgaris*)

SCHMELZER, Phytopath. Z. 46: 235, 1962/63 (*Robinia pseudo-acacia*)

Comments: The ringspot virus isolated by QUANTZ (1955) from *Phaseolus vulgaris* was found

to be serologically related to beet ringspot virus, tomato black ring virus, potato bouquet virus, and potato pseudo aucuba virus by BERCKS (Phytopath. Z. 46: 97, 1962). All these viruses are considered strains of the tomato black ring virus (cf. also HARRISON (1958) and BERCKS (1962)).

*Tomato spotted wilt virus

- A. SAMUEL, BALD & PITTMAN, Aust. Counc. Sci. Ind. Res. Bull. 44, 1930
- B. BLACK, BRAKKE, & VATTER, (1952); Virology 20: 120, 1963 (purification and electron microscopy)
- C. WHIPPLE, Phytopathology 26: 918, 1936 (*Lupinus polyphyllus* and *Pisum sativum*)
SNYDER & THOMAS, Hilgardia 10: 257, 1936 (*Lathyrus odoratus*)
COSTA, Bragantia 10: 67, 1950 (*Arachis hypogaea*)
HELMS, GRYLLS & PURSS, Aust. J. agric. Res. 12: 239, 1961 (*Arachis hypogaea*)

*Watermelon mosaic virus

- A. ANDERSON, Plant Dis. Repr 35: 233, 1951; Phytopathology 44: 198, 1954
 - B. VAN REGENMORTEL, BRANDES & BERCKS, Phytopath. Z. 45: 205, 1962 (morphology and size, serology)
 - C. GROGAN, HALL & KIMBLE, Phytopathology 49: 366, 1959 (*Medicago sativa* and *Melilotus indica*)
INOUE, Ber. Ohara Inst. landw. Biol. 12: 133, 1964 (*Pisum sativum* and *Cyamopsis psoraleoides*)
- Comments: VAN REGENMORTEL *et al.* (1962) found a distant serological relationship of the virus to the bean yellow mosaic virus and to the potato virus Y.

*White clover mosaic virus

- A. ZAUMEYER & WADE, J. agric. Res. 51: 715, 1935
 - B. BRANDES & QUANTZ, Arch. Microbiol. 26: 369, 1957 (morphology and size)
BOS, DELEVIĆ & VAN DER WANT, Tijdschr. PlZiekt. 65: 89, 1959 (serology)
- Comments: The name "pea wilt virus", introduced by F. JOHNSON (Phytopathology 32: 103, 1942) and rejected by Bos *et al.* (1959), is considered incorrect for the same reasons as mentioned for "pea mottle virus", see clover yellow mosaic virus.
- BRANDES (Mitt. Biol. Bundesanst. Land-Forstwirtschaft, Berlin-Dahlem 110, 1964) mentions a series of publications by BERCKS and BRANDES, demonstrating the distant serological relationship between the virus and Hydrangea ringspot virus, potato virus X, cactus virus X, clover yellow mosaic virus, and potato aucuba mosaic virus.

*Wound tumor virus

- A. BLACK, Proc. Amer. phyl. Soc. 88: 132, 1944; Amer. J. Bot. 32: 408, 1945
 - B. BLACK & BRAKKE, Phytopathology 44: 482, 1954 (serology)
BRAKKE, VATTER & BLACK, Brookhaven Symp. Biol. 6: 137, 1954 (purification and morphology)
BILS & HALL, Virology 17: 123, 1962 (size and structure)
- Comments: Although the virus was originally named "clover big vein virus", in 1945 BLACK suggested wound-tumor virus as a preferable name. Since then this name has almost exclusively been used.
- The virus was only found in leafhoppers naturally infected. It is only recorded here since it was described as a legume virus.

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- BOS, L., - 1963. Linnaeus en de plantevirologie. Vakbl. Biol. 43: 116-128.
- BOS, L., D. J. HAGEDORN & L. QUANTZ, - 1960. Suggested procedures for international identification of legume viruses. Tijdschr. PlZiekt. 66: 328-343.
- WEISS, F., - 1939. A key to the typical viruses of leguminous crops. Plant Dis. Repr 29: 352-361.
- WEISS, F., - 1945. Viruses described primarily of leguminous vegetable and forage crops. Plant Dis. Repr 154: 32-80.