HAUSTORIUM

Parasitic Plants Newsletter

Official Organ of the International Parasitic Seed Plant Research Group

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STATUS OF HAUSTORIUM

Our banner still refers to the International Parasitic Seed Plant Research Group, but since the meeting in Nantes and creation of the new International Parasitic Plant Society (IPPS) we expect this newsletter in due course to become an organ of that new society.

We are pleased to acknowledge that Old Dominion University is continuing to support the printing and mailing of Haustorium.

Many readers are already receiving Haustorium by Email. If any more of you wish to do so, please let Chris Parker know (Email address on the last page). Bear in mind that having an electronic version of the newsletter enables you to 'search'. If you cannot receive Email, or for any reason wish to go on receiving hard copy, you will continue to receive by airmail. The web-site version of this issue and past numbers of Haustorium are now available on **http://web.odu.edu/haustorium**, and on the IPPS site – **http://www.ppws.vt.edu/IPPS/**

COST ACTION 849 – PARASITIC PLANT MANAGEMENT IN SUSTAINABLE AGRICULTURE

The European Union-funded COST Action 849 'Parasitic Plant Management in Sustainable Agriculture' held a successful meeting at Bari, Italy from 18-20 October, 2001. There were separate meetings for each of the Working Groups 1, 2, 3 and 4 and finally a Management Committee Meeting under the Chairmanship of Diego Rubiales and Danny Joel. About 50 papers were presented for discussion and a set of abstracts is to be published shortly. It is hoped to list these in the next issue, together with brief reports from the Working Groups.

Further meetings are planned for Working Groups 1 and 3 (Biology and Ecology, and Resistance) in Sofia, Bulgaria in March 2002 and for WGs 2 and 4 (Biological Control and Integrated Control) and the Management Committee in Germany in September.

GR24 AND OTHER SYNTHETIC STIMULANTS

GR24 is a synthetic germination stimulant that is widely used in research on the parasitic weeds *Striga* and *Orobanche*. Binne Zwanenburg at the University of Nijmegen in The Netherlands prepares this stimulant, but production costs are substantial. He advises us that GR24 is available for purchase - minimum quantity 100 mg, standard quantity 200 mg - for a price of Euro 75 per 100 mg or Euro 150 per 200 mg. The payments will be to a non-profit foundation and are not therefore subject to VAT. If you are interested in obtaining GR24, please contact Binne Zwanenburg by e-mail **Zwanenburg@sci.kun.nl**

Binne Zwanenburg also reports that there have been encouraging field tests with the related compound Nijmegen-1 and that other

Nijmegen products are also under development. We congratulate Binne on these practical products of his fundamental work on germination stimulants and look forward to further detail of these developments in future issues of Haustorium.

Striga in Nusa Tenggara Province, Indonesia

Striga is known to occur in Indonesia and is included in the Indonesian Quarantine Service list of prohibited weeds. On the more developed islands of Java and Sumatra *Striga asiatica/lutea* is mentioned more as a curiosity than as a weed of economic importance.

When conducting an evaluation of the Nusa Tenggara Upland Farming Systems Project *Striga* was seen to be a major weed of both maize and sorghum crops in the Belun and Kefa districts of West Timor (Laycock and Bambang Murolenono, 1999). Unconfirmed reports indicate *Striga* also occurs near Kupang and Soe, also on the island of Timor . Photographs taken by agricultural staff strongly indicate Striga is a weed of sorghum on the island of Sumba between the towns of Waingapu and Melok.

Striga plants were 25 to 50 cm when flowering. Flowers were 1 to 1.5 cm long and usually a pale purple to pink colour. However a few plants associated with sorghum had white flowers and others varied from creamy and pink off whites to pale purple in both sorghum and maize. Plants were erect and well branched. The calyx had five ribs, eliminating *S. asiatica.* Preliminary identification by Mr Chris Parker indicates the species to be *S. curviflora* (see note below) but other species may also be present.

At a government rice seed multiplication farm smaller, (15-30 cm), erect, sparsely branched *Striga* plants with deep magenta flowers were found growing on wild grasses, *Dactyloctenium* and/or *Paspalum conjugatum* .Conditions are favourable for *Striga*. Soils are generally well drained and of low fertility, with a pH near neutral. They are often shallow in valleys and become rocky as one goes up slopes to the hills: farmers often plant on slopes to reduce weed growth. Both soils and rainfall vary considerably within short distances. Rainfall is irregular within and between seasons, ranging from less than 700 mm to more than 2,000 mm per annum. The number of wet days and length of rainy season also vary considerably. One to two crops a year are "normal", with occasionally three on the best land in good years.

One to three crops are grown in a year. Main season crops are maize, sorghum, greenbeans and groundnuts, planted in December and January. Striga grows every year in this season. Maize and greenbeans are grown in the second season and planted in March to April. When rains are good *Striga* is a problem, but when rains are poor there is little or no *Striga*. A third cropping season is sometimes possible in a few areas. Here maize, the sole crop, is planted in July to August. This season is hot and dry with little rain. There is no *Striga*.

A variation in host preference was indicated. Local maize was more heavily parasitised than newly introduced maize and in general few *Striga* plants were observed in sorghum. However individual sorghum fields did have heavy Striga infestations. Flowering *Striga* shoots were concentrated at, or within 10 cm of the planting station. *Striga* regrowth was apparent between rows in areas weeded with a local variation of the Dutch hoe.

Striga was present in virtually all maize fields near to the road north from Besikama to Halilulik (about half way towards Atambua). Plants were weakened, sometimes dead or with almost no grain. The maize was still in the grain filling stage.

Cereal crops are infected with *Striga* in the first, and to a lesser extent in the second wet

season. There were no reports of *Striga* in the third season, where the cereal grown is maize, rather than the more drought tolerant sorghum. There is no report of *Striga* in a wet dormant condition or that soil temperatures are sub-optimal for the germination and or attachment development stages. The cropped area is greatest in the first, and least in the third, season.

The majority of local farmers, (25 out of 29), interviewed along the roadside were aware of *Striga* and associate it with weak plants and reduced yields. However four farmers were unaware of any relationship between *Striga* and poor crop growth. They further associated *Striga* with critical land, that is land which has been "intensively cropped for a long time" and which is low in fertility. Rested land had little or no *Striga*.

Ministry of Agriculture Staff are generally unaware of the presence of Striga and its associated reductions of crop yield in this district. Farmers recognise the weed and have associated it with poor crop vigour and low yields. Interestingly, interviewed farmers attributed crop ill health and death to insects rather than to *Striga*. This was despite the association of flowering *Striga* with weak plants.

Striga is not a recent introduction to the area. Farmers identifying *Striga* said it had been around for as long as they could remember. Using historical events, *Striga* was present before the fall of Sukarno and the abortive communist coupe in 1965. This raises a number of questions for future strategies in cereal production and *Striga* management in this area: - why is the *Striga* problem largely unknown to, and unreported by government officials who make monthly returns of farmer problems to Jakarta? - how widespread is *Striga*? - is the area of *Striga* increasing? - is the *Striga* problem increasing in severity? - is *Striga* being spread in seed from the government seed farm?

Follow-up is required to first identify *Striga* infested areas and associated crops and second to positively identify the *Striga* species present. Establishing whether or not the area of *Striga* infestation has increased in the recent past is also necessary, particularly given the increase in land use pressure. The farming systems programme from the Agricultural Institute for Adaptive Technology at Naibonat is ideally placed to look at cultural ways to minimise the impact of *Striga* given it has a sub-station in the area. There is also the question of whether or not *Striga* is present in the newly independent country of Timor. March and early April are appropriate times for field inspection of *Striga*.

Reference:

Laycock, D. and Bamban Murdolelonon. 1999. *Striga*, an underestimated parasitic weed of Nusa Tenggara. In: Proc. Workshop on Integrated Weed Management in Managed and Natural Ecosystems. BIOTROP Special Publication No. 61: 127-135.

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IDENTIFICATION OF SOME SOUTH-EAST ASIAN *STRIGA* SPP.

In the course of helping to determine the *Striga* specimens collected in West Timor (see note above) it became apparent that the brief information on 'Additional species occurring in Australia and Southeast Asia' in Parker and Riches (1993) was misleading. Reference to the original descriptions by Bentham (1869) in Flora Australiensis Volume IV Stylideae to Pedalineae confirms that each of the three species, *S. multiflora* Benth. , *S. curviflora* Benth. and *S. parviflora* Benth. has a 5-ribbed calyx. However, in no case is the upper lip of the corolla longer than the lower. Flower colour is not clearly indicated and does not appear to be a reliable character.

Some workers believe that the distinctions made by Bentham are not sound and that further work could show that a single polymorphic species is involved, but on the basis of Bentham (1869), the following is a revised summary of these three species to replace that on p. 18 of Parker and Riches (1993):

***Striga curviflora* Benth.** Robust, often over 30 cm high. Calyx 5-ribbed, 6 mm long; corolla 8-10 mm long with lower lobes 6-8 mm, upper much shorter, 2-3 mm, slightly notched and often recurved. Flower colour variable.
***Striga multiflora* Benth.** Robust, often over 30 cm high. Calyx 5-ribbed, 4-5 mm long; corolla 6-8 mm long, upper lip more than half as long as the lower, broadly lobed. Flower colour variable.
***Striga parviflora* Benth.** Smaller than the above, up to 20 cm high. Calyx 5-ribbed, 2-3 mm long; corolla 6 mm with lobes very short. Flower colour variable.'

Other corrections we would like to point out include:
p. 4 – authority of *S. hermonthica* should be (Del.) Benth.
pp. 21, 167-8 – '*Ramphicarpa*' should be *Rhamphicarpa*.
p. 23 – in Figure 1.5. formula b) should have O added top right and in e) the ring should be a benzene ring.

We regret any confusion these errors may have caused.We also regret that 'Parasitic Weeds of the World' is now out of print. If any readers have spare copies for disposal, they are likely to find a quick sale through the pages of Haustorium.

Chris Parker and Charlie Riches.

PROCEEDINGS OF THE 7TH INTERNATIONAL SYMPOSIUM, NANTES

Proceedings of the 7th International Symposium are no longer available as hard copy but a version on CDRom is now available at a cost of 40 Euros or 40 US$. Please Email your request to **ipws@svt.univ-nantes.fr** together with postal address, credit card number and expiry date. Those without CDRom facilities, or with serious difficulty over remitting payment should request further advice.

OBITUARY – EDWARD TERYOKHIN

22 May 1932 – 1 December 2001

Readers of Haustorium will be saddened to learn of the death of Professor Teryokhin of the Komorov Botanical Institute in St Petersburg, Russia. Edward was a frequent participant in symposia and workshops where his enthusiasm, quick smile, and love of dancing charmed us. His contributions to parasitic plant biology are many, most notably in the field of plant morphology. One of the last classical plant morphologists, he developed a phylogenetic scheme of haustorial evolution based on extensive observations of species of *Orobanche*. He published one book in English is "Weed Broomrapes" (1997, Ausfsteif Verlag).
Professor Teryokhin is survived by his wife and one son. His warmth and friendship will be sorely missed.

Lytton John Musselman and Klaus Wegmann

NOW AVAILABLE ON CDROM

Breeding for Striga Resistance in Cereals
and
Application of Molecular Markers in Plant Breeding

The proceedings of the workshop held at IITA, Ibadan, Nigeria, in August 1999, 'Breeding for Striga Resistance in Cereals', edited by B.I.G. Haussmann, D.E. Hess, M.L. Koyama, L. Grivet, H.F.W. Rattunde, and H.H. Geiger, and published by Margraf Verlag, Weikersheim, Germany, are now available on CD. The same CD also includes the ICRISAT Training Manual 'Application of Molecular Markers in Plant Breeding',

edited by B.I.G. Haussmann, H.H. Geiger, D.E. Hess, C.T. Hash, and P. Bramel-Cox.

For a free copy of the CD, please contact: Dr. V. Mahalakshmi,ICRISAT, Patancheru 502 324, Andhra Pradesh, India; e-mail: **v.mahalakshmi@cgiar.org** or Dr. B.I.G. Haussmann, University of Hohenheim, Inst. 350b, 70593 Stuttgart, Germany, e-mail: **haussb@uni-hohenheim.de**

WEBSITES

For past and current issues of Haustorium see: **http://web.odu.edu/haustorium**

For information on the new International Parasitic Plant Society see: **http://www.ppws.vt.edu/IPPS/**

For Lytton Musselman's Plant site see: **http://web.odu.edu/plant**

For Dan Nickrent's 'The Parasitic Plant Connection' see: **http://www.science.siu.edu/parasitic-plants/index.html**

For The Mistletoe Center (including a comprehensive Annotated Bibliography on mistletoes) see: **http://www.rms.nau.edu/misteltoe/welcome.html**

For on-line access to USDA Forest Service Agriculture Handbook 709 'Dwarf Mistletoes: Biology, Pathology and Systematics' (now out of print), see: **http://www.rmrs.nau.edu/publications/ah_709/**

LITERATURE

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Adler, L.S. and Wink, M. 2000. Transfer of quinolizidine alkaloids from hosts to hemiparasites in two *Castilleja-Lupinus* associations: analysis of floral and vegetative tissues. Biochemical Systematics and Ecology 29: 551-561. (*Castilleja miniata* and *C. indivisa* have reduced herbivory but no reduced pollination when absorbing alkaloids from host *Lupinus* spp., apparently because the alkaloids do not reach the nectar.)

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Anil, V.S. and Sankara Rao, K. 2001. Purification and characterization of a Ca^{2+}-dependent protein kinase from sandalwood (*Santalum album* L.): evidence for a Ca^{2+}-induced conformational changes. Phytochemistry 58: 203-212.

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Basava Raju, G., Rama Rao, P.V., Reddy, K.B. and Rao, Piratla. N. 2001. An important breakthrough in biocontrol of *Cuscuta chinensis* Lam. In: Abstracts of National Symposium on 21st Century Perspectives in Plant Sciences, July, 2001, Andhra University, Visakhapatnam 530003, India. (Relating to the inhibitory effect of cluster bean on *C. chinensis* – or possibly *C. campestris*?)

Borsics, T. and Lados, M. 2001. cDNA cloning of a mechanical/abiotic stress-inducible calmodulin-related gene from dodder-infected alfalfa. Plant, Cell and Environment 24: 649-656. ('Results implicate roles for Ca^{2+} and *PPRG1* in the transduction of signals from the environment.')

Chivinge, O.A., Kasembe, E. and Mariga, I.K. 2001. The effect of different cowpea cultivars on witchweed and maize yield under dryland conditions. Proceedings The BCPC Conference - Weeds 2001: 163-168. (Six cowpea varieties inter-planted within the maize row reduced *Striga asiatica* numbers and significantly increased maize yield compared with sole-crop maize, while stover yields were similar or somewhat lower. There were no significant differences between cowpea varieties.)

Dor, E., Plakhine, D. and Herschenhorn, J. 2001. Phytopathogenic fungi of the parasitic plant Egyptian broomrape (*Orobanche aegyptiaca*). (abstract) Phytoparasitica 29: 272-273. (Among species isolated from *O. aegyptiaca*, *Fusarium solani* and *Macrophomina phaseolina* damaged the parasite at all stages, while *Rhizoctonia solani* did so only at early stages.)

Dubé, M-P. and Olivier, A. 2001. Le *Striga gesnerioides* et son hôte, le niébe: interaction et méthodes de lutte. Canadian Journal of Botany 79: 1225-1240. (A thorough and generally informative review of *S. gesnerioides* in cowpea, but regrettably repeating inaccurate observations concerning inheritance of undesirable characters from resistant line B.301, refuted by B.B. Singh in Haustorium 34.)

El-Fadi Aly, A.A. and El-Deen Mohamed Zaky, G. 2000. (An economical study for the factors affecting production of broad bean in Sohag Governorate.) (in Arabic) Assiut Journal of Agricultural Sciences 31: 339-350. (Referring to *Orobanche crenata* as a serious problem.)

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Gacheru, E. and Rao, M.R. 2001. Managing *Striga* infestation on maize using organic and inorganic nutrient sources in western Kenya. International Journal of Plant Management 47: 233-239. (Residues of 6 agroforestry species compared at 5 t d.wt./ha with inorganic fertilizers over 4 seasons. *S. hermonthica* numbers lowest after 120 kg N/ha/season. No effect of P on *Striga*. *Tithonia diversifolia* best of the organics, decomposing fast. *Sesbania sesban* only effective after 4 seasons. *Calliandra calothyrsus, Lantana camara, Croton megalocarpus* and *Senna spectabilis* slower to decompose and had little effect.)

Goldwasser, Y., Lanini, W.T. and Wrobel, R.L. 2001. Tolerance of tomato varieties to lespedeza dodder. Weed Science 49: 520-523. (Demonstrating useful resistance to *C. pentagona* (=*C. campestris*) in three Heinz tomato varieties 9492, 9553 and 9992, compared with a susceptible var. Halley 3155.)

Gworgwor, N.A., Ndahi, W.B. and Weber, H-Chr. 2001. Parasitic weeds of North-eastern Nigeria: a new potential threat to crop production. Proceedings The BCPC Conference - Weeds 2001: 181-186. (Surveys suggest that in addition to the widespread *Striga hermonthica* on cereals, *S. gesnerioides* on cowpea, *Alectra vogelii* on cowpea and groundnut, and *Tapinanthus oleifolius* on shea butter-nut, there is significant occurrence of *S. aspera, S. densiflora*(?), *Rhamphicarpa fistulosa* and *Buchnera hispida* on cereals. *Cuscuta campestris* is increasingly common but so far only on weeds.)

Harish, M.S. , Mallikarjun Nagur and Shrishailappa Badami. 2001. Antihistamine and mast cell stabilising activity of *Striga orobanchoides*. Journal of Ethnopharmacology 76: 197-200. (*S. orobanchoides* = *S. gesnerioides*.)

Haussmann, B.I.G., Hess, D., Omanya, G.O., Reddy, B.V.S., Welz, H.G. and Geiger, H.H. 2001. Major and minor genes for stimulants of *Striga hermonthica* seed germination in sorghum, and interaction with different *Striga* populations. Crop Science 41: 1507-1512. (Studies using *S. hermonthica* populations from Mali, Niger and Kenya suggested that the low-stimulant character in sorghum (vars Framida and IS 9830) was associated with one major recessive gene but affected also by a range of minor genes, especially in the case of the Kenya population.)

Haussmann, B.I.G., Hess, D., Omanya, G.O., Reddy, B.V.S., Mukuru, S.Z., Kayentao, M., Welz, H.G. and Geiger, H.H. 2001. Quantitative-genetic parameters of sorghum growth under *Striga* infestation in Mali and Kenya. Plant Breeding 120: 49-56. (Field tests with 36 diallel F_2 populations from 9 varieties tested at 4 locations, showed significant genotype x environment interactions. Results suggest the potential merit of heterozygous cultivars, the need for multilocation testing, and the ideal of a combination of resistance with tolerance.)

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Holzappel, S. 2001. Studies of the New Zealand root-parasite *Dactylanthus taylorii* (Balanophoraceae). Englera No 22: 176 pp. (Apparently a fund of detailed morphological and other information on this endangered endemic species, including its germination behaviour and also reviewing the history of previous research. The extended abstract in Weed Abstracts (Vol 50(9) abs. 3176) curiously makes no mention of its hosts.)

Javanbakht, M. and Ghadri, H. 2000. Competitive effect of redroot pigweed (*Amaranthus hybridus* L.) and broomrape (*Orobanche aegyptiaca* L.) on potato in greenhouse conditions. (in Iranian) Iranian Journal of Agricultural Sciences 31: 7-17. (Potato growth increasingly reduced by *O. aegyptiaca* at rates of seed from 20 to 80 mg/pot.)

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violaxanthin and lutein epoxide in the Australian mistletoe *Ameyema miquelii*. Australian Journal of Plant Physiology 28: 793-800. ('Results raise a question as to whether lutein and lutein epoxide cycling may provide an auxiliary means of energy dissipation.')

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Miller, J.F. and Dominguez, J. 2000. Registration of seven *Orobanche* resistant sunflower germplasms. Crop Science 40: 588. (Lines R-185, R-188, R-190, R-201, R-201, R-206 and R-207 released in Spain in 1997 show 'improved resistance' to *Orobanche cernua/cumana*.)

Miyanoto, S. 2001. (The family Orobanchaceae from Rebun Island. (in Japanese) Rishiri Studies 20: 61-62. (Reporting *Orobanche caerulescens* and *Phacellanthus tubiflorus*.)

Mpofu, L.T. 2000. Sorghum and millets in Zimbabwe – production, constraints, and current research. International Sorghum and Millets Newsletter 41: 3. (Noting '*Striga asiatica* is also of importance in sorghum and finger millet.')

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