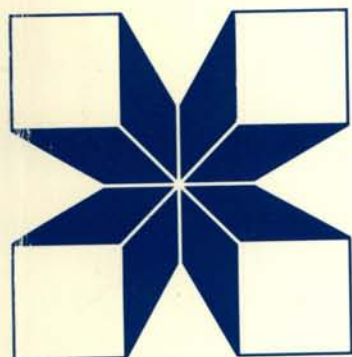


IDRC
CRDI
CIID



C A N A D A

**OIL CROPS:
PROCEEDINGS OF THE
THREE MEETINGS HELD
AT PANTNAGAR AND
HYDERABAD, INDIA,
4 – 17 JANUARY 1989**

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in six sectors: agriculture, food and nutrition sciences; health sciences; information sciences; social sciences; earth and engineering sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are in Ottawa, Canada. Regional offices are located in Africa, Asia, Latin America, and the Middle East.

Le Centre de recherches pour le développement international, société publique créée en 1970 par une loi du Parlement canadien, a pour mission d'appuyer des recherches visant à adapter la science et la technologie aux besoins des pays en développement; il concentre son activité dans six secteurs : agriculture, alimentation et nutrition; information; santé; sciences sociales; sciences de la terre et du génie et communications. Le CRDI est financé entièrement par le Parlement canadien, mais c'est un Conseil des gouverneurs international qui en détermine l'orientation et les politiques. Établi à Ottawa (Canada), il a des bureaux régionaux en Afrique, en Asie, en Amérique latine et au Moyen-Orient.

El Centro Internacional de Investigaciones para el Desarrollo es una corporación pública creada en 1970 por el Parlamento de Canadá con el objeto de apoyar la investigación destinada a adaptar la ciencia y la tecnología a las necesidades de los países en desarrollo. Su actividad se concentra en seis sectores: ciencias agrícolas, alimentos y nutrición; ciencias de la salud; ciencias de la información; ciencias sociales; ciencias de la tierra e ingeniería; y comunicaciones. El Centro es financiado exclusivamente por el Parlamento de Canadá; sin embargo, sus políticas son trazadas por un Consejo de Gobernadores de carácter internacional. La sede del Centro está en Ottawa, Canadá, y sus oficinas regionales en América Latina, Africa, Asia y el Medio Oriente.

This series includes meeting documents, internal reports, and preliminary technical documents that may later form the basis of a formal publication. A Manuscript Report is given a small distribution to a highly specialized audience.

La présente série est réservée aux documents issus de colloques, aux rapports internes et aux documents techniques susceptibles d'être publiés plus tard dans une série de publications plus soignées. D'un tirage restreint, le rapport manuscrit est destiné à un public très spécialisé.

Esta serie incluye ponencias de reuniones, informes internos y documentos técnicos que pueden posteriormente conformar la base de una publicación formal. El informe recibe distribución limitada entre una audiencia altamente especializada.

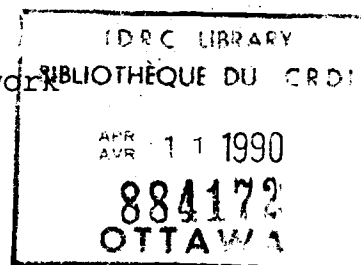
IDRC-MR252e
February 1990

**OIL CROPS:
PROCEEDINGS OF THE THREE MEETINGS HELD AT
PANTNAGAR AND HYDERABAD, INDIA, 4-17 JANUARY 1989**

1. The Brassica Subnetwork-II
2. The Other Oil Crops Subnetwork-I
3. The Oil Crops Network Steering Committee-I

Edited by

Abbas Omran
Technical Adviser, Oil Crops Network



Organized by

Indian Council of Agricultural Research, New Delhi, India
G.G. Pant University of Agriculture and Technology,
Pantnagar, India
Directorate of Oilseeds Research, Hyderabad, India
International Development Research Centre, Ethiopia/Canada

Material contained in this report is produced as submitted and has not been subjected to peer review or editing by IDRC Communications Division staff. Unless otherwise stated, copyright for material in this report is held by the authors. Mention of proprietary names does not constitute endorsement of the product and is given only for information.

CONTENTS

Foreword	v
List of Participants	vi
Introduction	xi

Part 1. Brassica Subnetwork-II

Opening Remarks. MAHATIM SINGH	2
Recent Development in Oilseed Brassicas. R.K.DOWNEY	4
The Interinstitutional Collaborative Research Program on White Rust (<i>Albugo candida</i>) Between India (ICAR) and Canada (IDRC) for Rapeseed-Mustard Improvement. P.R.VERMA	9
Stability Parameters for Seed Characters In Different Species of Oleiferous Brassica. H.SINGH, D.SINGH, and V.S. LATHER	14
Oilseed Brassica Research in India. P.R.KUMAR	17
Transfer of Technology and On-farm Trials of Rapeseed and Mustard. BASUDEO SINGH	24
Status of Breeding Research on brassica Oil Crops at Pantnagar, India. G.N.SACHAN	30
Agronomic Investigations on Rapeseed and Mustard at Pantnagar. ARVIND KUMAR and R.P. SINGH	35
Disease Problems in Brassicas and Research Activities at Pantnagar. S.J.KOLTE, R.P.AWASTHI and VISHWANATH	43
Effect of Some Epidemiological Factors on Occurrence and Severity of Alternaria Blight of Rapeseed and Mustard. R.P. AWASTHI and S.J.KOLTE	49
Problems of Insect Pests in Brassicas and Research Work at Pantnagar. G.C.SACHAN	56
Economic Performance, Potential and Constraints in Toria Production. L.R.SINGH	66
Rapeseed In Egypt. BADR A.EL-AHMAR	70
The Role of High-Yielding Varieties and Production Techniques on Oilseed Brassica Performance in the Central, South-Eastern and North-Western Zones of Ethiopia. HIRUY BELAYNEH, GETINET ALEMAW and NIGUSSIE ALEMAYEHU	72
The Achievements and Future of Brassica in Kenya. M.J.MAHASI	79
Rapeseed Adaptation Trials in Cyprus. A.HADJICHRISTODOULOU	83
The Rapeseed (<i>Brassica napus</i> L.) Quality Breeding Progress in Shanghai Academy of Agricultural Sciences (SAAS) for Recent Years. SUN CHAOCAI	92
Statement on the Execution of the Sino-Canadian Rapeseed Breeding Project in 1988. WANG ZAO MU	94
A Preliminary Study on the Combining Ability and Heritability of Main Agronomic Characters in <i>B. juncea</i> . WANG ZAO MU and WANG YAN FEI	98
Report on the Execution of Sino-Canada Research Breeding Project. LIU CHENG QUING and HONG HAI PING	103

A Review of Orobanche Problem in Nepal. M.L.JAYASWAL	106
Oil Crops in Bhutan. TAYAN RAJ GURUNG	119
Brassica Production and Research in Pakistan. REHMAT ULLAH KHAN and MASOOD A.RANA	127
Summary and Wrap-up for Brassica Sub-Network Meeting. HUGH DOGGETT ..	130
Report on a Tour to Oilseed Brassica Growing Areas of India. GETINET ALEMAW	136
Discussions and Recommendations	138

Part 2. Other Oilcrops Subnetwork-I

Safflower Research and Coordination in India. V.RANGA RAO	144
Highlights of the Second International Safflower Conference Hyderabad, India from January 9-13, 1989. V.RANGA RAO	147
Coordinated Research Efforts and Linseed (<i>Linum Usitatissimum</i> L.) Improvement in India. MANGALA RAI	149
Safflower Research in Eighties in Madhya Pradesh (India). A.R.SAWANT	154
Nigerseed in India: Present Status of Cultivation, Research Achievements and Strategies. S.M.SHARMA	159
Constraints and Opportunities for Increasing the Production and Productivity of Niger in India. S.M.SHARMA	166
New Potential Areas of Niger in India. S.M.SHARMA	169
Present Production, Research and Future Strategy for Niger in Maharashtra. A.V.JOSHI	171
Niger in Tribal Bihar. H.B.P.TRIVEDI	176
Cultivation and Varietal Improvement of Linseed in India. R.N.DUBEY .	180
Agronomic Management/Agro-Techniques for Improving Production of Niger and Linseed. G.L.MISHRA	186
The Present Status of Niger and Linseed Pathology Work in India. G.S.SAHARAN	192
Safflower, Niger and Linseed in Nepal. B.MISHRA	203
Country Paper on Other Oilcrops in Bangladesh. M.A.KHALEQUE and DILRUBA BEGUM	208
Country Report on Linseed and Safflower in Pakistan. MASOOD A.RANA, MOHAMMAD SHARI, and ALTAF H.CHAUDHRY	213
Present Status of Safflower in Egypt. BADR A. EL-AHMAR	218
Progress in Linseed On-station and On-farm Research in Ethiopia. HIRUY BELAYNEH, NIGUSSIE ALEMAYEHU and GETINET ALEMAW	220
Investigations on Some Biochemical Characteristics of Nigerseeds (<i>Guizotia abyssinica</i> Cass). GETINET ALEMAW and HIRUY BELAYNEH	229
Processing of Oil Seeds in Ethiopia. DEJENE TEZERA	233
The Status of Linseed, Safflower and Niger Research and Production in Kenya. T.C.RIUNGU	238
Summary and Wrap-up for Other Oilcrops Sub-Network Meeting. HUGH DOGGETT	241
Discussions and Recommendations	248

Part 3. Oilcrops Network Steering Committee-I

The Oilcrops Network for East Africa and South Asia, Achievements and Future. ABBAS OMRAN	256
Recent Developments in The Oil Crops Network and the ORU. HUGH DOGGETT	265
IBPGR's New Concept for the Conservation and Utilization of Germplasm; Global Crop Networks. J.M.M.ENGELS	272
Technology Mission on Oilcrops for Self-Reliance in Vegetable Oils in India. MANGALA RAI	274
Oilseeds Research in India: Network, Its Set Up, Organization, Past Achievements and Current Research Thrusts. V.RANGA RAO	283
Groundnut and the Oilcrops Network. S.N.NIGAM	286
Oilcrops Production in Ethiopia Current Status and Future Prospects. SEME DEBELA	288
The Vegetable Oil/Protein System in Kenya Summary Report-Phase I. C.ZULBERTI and J.LUGOGO	293
Brassica Sub-Network Achievements and Activities, 1987-88. HIRUY BELAYNEH	320
The Present Situation and Main Achievements of Sesame Production in East Africa. MOHAMMED EL-HASSAN AHMED	324
Constituion of the Oil Crops Network (Second Draft). MASOOD A.RANA and ABBAS OMRAN	330

EFFECT OF SOME EPIDEMIOLOGICAL FACTORS ON OCCURRENCE AND SEVERITY OF ALTERNARIA BLIGHT OF RAPESEED AND MUSTARD

R.P. Awasthi and S.J. Kolte

Abstract

Correlations between weather factors and severity of *Alternaria blight* (AB) on rapeseed yellow sarson cv T-151 and mustard cv Varuna (T-59) were established based on the data obtained over a seven-year crop period (1980-1987). Relative humidity ($>67\%$), total rainy days (>6), rainfall ($>70\text{mm}$) and minimum temperature ($7-10^{\circ}\text{C}$) concomitant with maximum temperature ($20-23^{\circ}\text{C}$) were found to be positively correlated ($r = 0.511-0.805$) with AB severity on leaves, whereas the former two factors only showed significant positive correlation ($r = 0.758$ and 0.962) for the spread of pod infection. Relative humidity below 67% was less conducive for a severe development of the disease. The prediction equations for AB severity were derived by regression analysis. The severity of AB was found to be favoured by the above weather factors beyond 30 days of age and the increase in age was positively correlated ($r = 0.777-0.980$) with the increase in the susceptibility of the crop; the maximum leaf disease severity being at rosette to flowering stage of the crop.

Alternaria blight of rapeseed-mustard is a disease of economic importance in India (2). It occurs quite regularly every year during the crop season (October to March) resulting in 35-46% yield loss (3). In certain cultivars of yellow sarson, the loss in yield may go to the extent of 70%. Though effects of fungicidal sprays, planting dates, etc. have been studied on control of the disease, basic information with respect to epidemiological factors on occurrence and severity of the disease have not been well documented. The present investigation deals with the study of some weather factors and the effect of plant age on the development of the disease. The results obtained over seven-year crop season (1980-1987) are presented herein.

Materials and Methods

1. Growing of the Brassica species and the field layout

Two susceptible *Brassica* species viz., *B. juncea* cv T-59 (Varuna) and *B. campestris* var yellow sarson cv T-151 along with four other exotic *Brassica* species (*B. alba*, *B. carinata*, *B. juncea* and *B.*

napus) were grown at the Crop Research Centre, Pantnagar, in seven consecutive crop seasons (from 1980-81 to 1986-87). Randomized block design using 3×4 m plot size with four replications was followed each year. The sowing was done in rows spaced at 40 cm distance keeping plant-to-plant spacing at 15 cm. A distance of 1.5 m was maintained between plots and replications. Nitrogen @ 100 kg/ha was applied along with phosphorus (40 kg/ha) and potash (40 kg/ha). The sowing was done in the middle of October in 1982 and 1986 and in the last week of October in the other five crop seasons. Other agronomic practices including weeding, irrigation, etc. were followed whenever needed to maintain the proper growth. The crop was protected against aphid infestation by a spray of Metasystox @ 0.1%.

2. Recording the AB severity

Average disease severity on leaf and pod was taken separately at weekly interval using 0-5 rating scale which is given in Table 1.

Twenty five leaves/pods were collected randomly from each plot and rated. The disease index was

then calculated using the formula:
 Disease index (%) =

$$\frac{\text{Sum of all numerical ratings}}{25 \times 5} \times 100$$

Table 1. Rating scale used to measure AB disease severity.

Rating Scale	Area covered by spots (%)	
	Leaf	Pod
0	No symptoms	No symptoms
1	1-10	1-10
2	11-25	11-20
3	26-50	21-30
4	51-75	31-50
5	> 75	> 50

3. Studying the relationship of weather factors associated with the development of AB

Final severity of AB on middle leaf (on the main stem) referred to as Y_1 and on pod (on the main raceme) referred to as Y_2 in different crop seasons were pooled together cultivar-wise and correlated with the meteorological factors viz., mean maximum (x_1) and mean minimum (x_2) temperatures, per cent relative humidity (x_3), total rainfall (x_4), total number of rainy days (x_5) and sunshine hours/day (x_6) recorded for the period between the 5th and the 15th week after sowing for leaf infection and for the period between the 10th and the 18th week after sowing for pod infection. The correlation coefficient (r) between the average disease index and weather factors was computed as per the method given by (5). Similarly the predicted mean disease severity index "y" equation ($Y = a + b_1 x_1 + b_2 x_2 + \dots + b_6 x_6$) was derived by multiple regression analysis, where "y" denotes the predicted AB severity on leaf (Y_1) and on pod (Y_2); "a" denotes the intercept and " b_1 " to " b_6 " denote partial regression coefficients for x_1 to x_6 weather factors. Significance of correlation coefficient (r) and coefficient of determination (R^2) was followed at 5% level of probability.

4. Computation of apparent infection Rate

Apparent infection rates (ir) were calculated from the AB severity index at different week times of the plant growth using the formula given by:

$$ir = \frac{2.3}{t_2 - t_1} \log_{10} \frac{x_2(1 - x_1)}{x_1(1 - x_2)}$$

where ir = apparent infection rate in non-logarithmic phase; x_1 disease index at initial week time t_1 ; and x_2 = disease index at subsequent week times t_2 . The apparent infection rates were further used to assess the maximum and minimum infection periods with respect to each crop species in relation to age.

Results and Discussion

In order to understand the effect of weather factors on the most commonly grown susceptible cultivars of mustard (Varuna) and yellow sarson (T-151), the results obtained with respect to these two only are described below. The results on other Brassica species which are not cultivated in India will be described in a separate research article.

1. Leaf infection severity of AB on yellow sarson and mustard

Significant positive correlations ($r = 0.764$ to 0.804) were observed between AB severity index on the yellow sarson leaf and relative humidity (RH), total rainfall (RF) and minimum temperature (Mi Temp). Similar results were obtained with respect to AB severity on leaf of the mustard ($r = 0.725$ to 0.805), but the "r" values in respect of the RH and RF factors were non-significant, Table 1. The values of the R^2 values revealed that a combined effect of RH, RF and Mi temp accounted for more than 98%

variation in AB severity on leaves of both yellow sarson and mustard, (Table 2). The AB severity prediction equations as derived in the present studies for leaf infection phase in respect of yellow sarson and mustard are given below:

- i. AB leaf infection severity on yellow sarson:

$$(Y_1) = -49.95 + (8.28 X_2) + (0.12 X_3) + (0.85 X_4) + (-0.95 X_5) + (1.13 X_6).$$

- ii. AB leaf infection severity on mustard:

$$(Y_1) = 63.78 + (10.80 X_2) +$$

$$(-2.38 X_3) + (1.19 X_4) + (-2.58 X_5) + (3.64 X_6).$$

The crops were found to be susceptible to leaf infection phase during rosette to flowering stage when the maximum temperature (Max Temp) ranged between 20 and 23°C and the Mi Temp was in the range of 7-10°C with average RH of 67-73% concomitant with total RF of 70mm and sunshine period (SP) of 5-7 h/day, (Fig. 1). Less than 67% RH and less than 7°C Mi Temp, irrespective of other favourable factors, did not result in severe occurrence of the leaf infection phase.

Table 1. Relationship of weather factors associated with AB severity on leaves of yellow sarson and mustard, as measured by correlation coefficient (r).

Brassica species	Max. Temp. (°C)	Min. Temp. (°C)	R.H. (%)	Total rainfall (mm)	Total rainy days	Sunshine (h/day)
	X_1	X_2	X_3	X_4	X_5	X_6
<i>B. campestris</i> var.						
yellow sarson cv T-151	0.190	0.764*	0.804*	0.784*	0.527	-0.608
<i>B. juncea</i> cv T-59	0.302	0.805*	0.706	0.725	0.511	-0.582

*Significant at 5% level of probability.

Table 2. R^2 values of different stepwise multiple regression equations for prediction of AB severity on leaves (Y_1) of yellow sarson and mustard.

Stepwise predication equations	R^2
<i>B. campestris</i> var yellow sarson cv T-151:	
1. $Y_1 = a + b_3 X_3$	0.65*
2. $Y_1 = a + b_3 X_3 + b_2 X_2$	0.79*
3. $Y_1 = a + b_3 X_3 + b_2 X_2 + b_4 X_4$	0.99*
4. $Y_1 = a + b_3 X_3 + b_2 X_2 + b_4 X_4 + b_5 X_5$	0.99*
5. $Y_1 = a + b_3 X_3 + b_2 X_2 + b_4 X_4 + b_5 X_5 + b_6 X_6$	0.99*
<i>B. juncea</i> cv T-59:	
6. $Y_1 = a + b_2 X_2$	0.65*
7. $Y_1 = a + b_2 X_2 + b_4 X_4$	0.98*
8. $Y_1 = a + b_2 X_2 + b_4 X_4 + b_3 X_3$	0.98*
9. $Y_1 = a + b_2 X_2 + b_4 X_4 + b_3 X_3 + b_5 X_5$	0.99*
10. $Y_1 = a + b_2 X_2 + b_4 X_4 + b_3 X_3 + b_5 X_5 + b_6 X_6$	0.99*

*Significant at 5%.

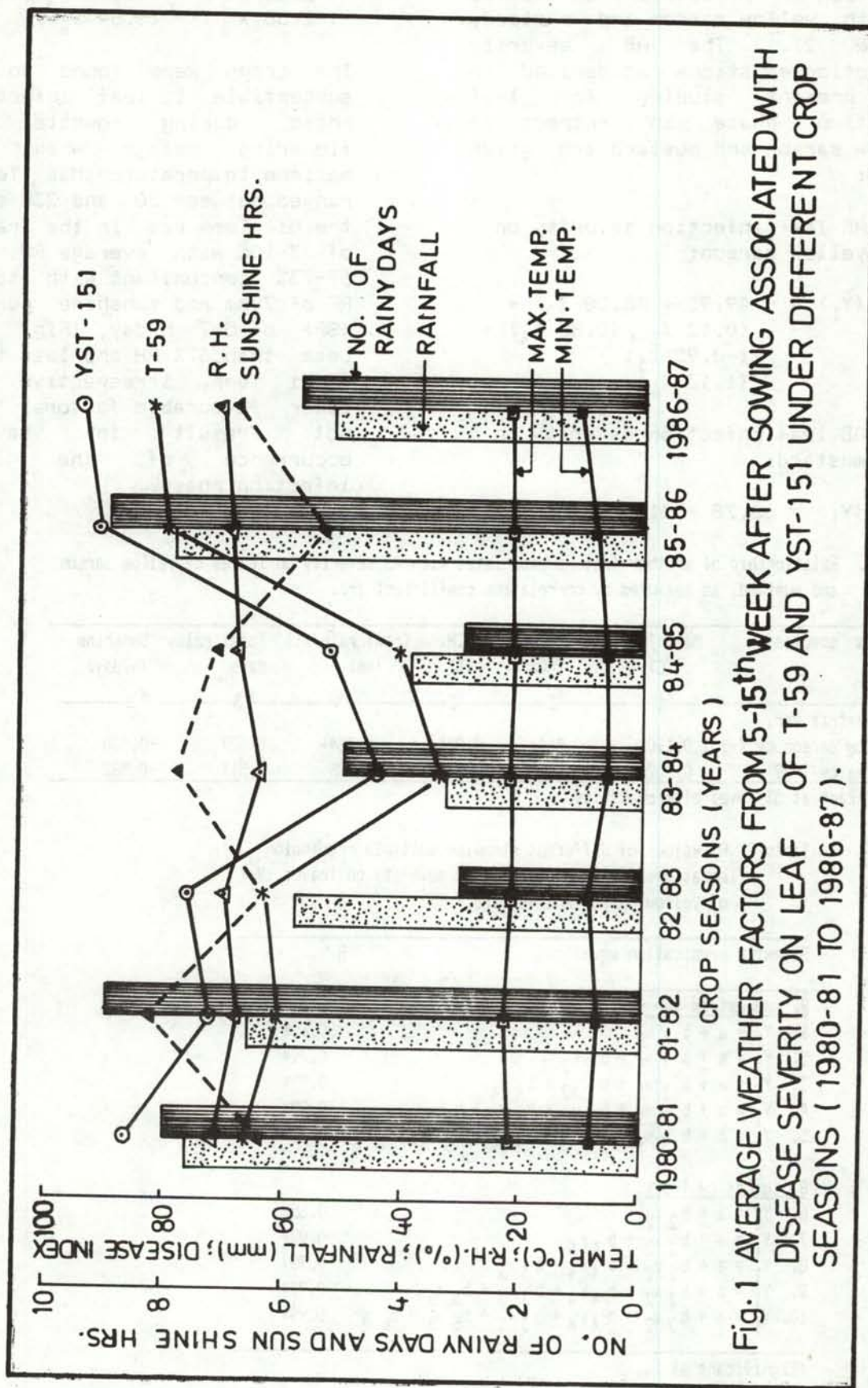


Fig.1 AVERAGE WEATHER FACTORS FROM 5-15th WEEK AFTER SOWING ASSOCIATED WITH DISEASE SEVERITY ON LEAF OF T-59 AND YST-151 UNDER DIFFERENT CROP SEASONS (1980-81 TO 1986-87).

2. Pod infection severity of AB on yellow sarson and mustard

Total rainy days (TRD) ($r = 0.962$ and 0.758 , respectively) showed significant positive correlation with AB development on pods of yellow sarson and mustard, (Table 3). When TRD was included in the prediction equation for yellow sarson, the value of R^2 was more than 93%, (Table 4), indicating, there by, that AB severity on yellow sarson pods was mainly influenced by the frequency of TRD

during the time from flowering to yellow pod stage of the crop. But in the case of mustard, R^2 values for RH showed maximum (57%) variation suggesting, thereby, the importance of RH factor in pod infection of mustard. Thus it is concluded that high frequency of TRD and RH appear to be more important factors for the spread of AB infection on pods, (Fig. 2). Similar results have been reported under the Punjab (1) and West Bengal (4) conditions.

Table 3. Relationship of weather factors associated with AB severity on pods of yellow sarson and mustard as measured by correlation coefficient (r).

Brassica species	Max. Temp. (°C)	Min. Temp. (°C)	R.H. (%)	Total rainfall (mm)	Total rainy days	Sunshine (h/day)
	x_1	x_2	x_3	x_4	x_5	x_6
<i>B. campestris</i> var.						
yellow sarson cv T-151	-0.635	-0.001	0.645	0.590	0.962*	-0.324
<i>B. juncea</i> cv T-59	-0.387	0.334	0.758*	0.144	0.670	-0.511

*Significant at 5%.

Table 4. R^2 values of different stepwise multiple regression equations for prediction of AB severity on pods (Y_2) of yellow sarson and mustard.

Stepwise predication equations	R^2
<i>B. campestris</i> var yellow sarson cv T-151:	
1. $Y_2 = a + b_5 x_5$	0.93*
2. $Y_2 = a + b_5 x_5 + b_1 x_1$	0.94*
3. $Y_2 = a + b_5 x_5 + b_1 x_1 + b_6 x_6$	0.98*
<i>B. juncea</i> cv T-59	
4. $Y_2 = a + b_3 x_3$	0.57*
5. $Y_2 = a + b_3 x_3 + b_1 x_1$	0.66*
6. $Y_2 = a + b_3 x_3 + b_1 x_1 + b_5 x_5$	0.91*
7. $Y_2 = a + b_3 x_3 + b_1 x_1 + b_5 x_5 + b_2 x_2$	0.99*
8. $Y_2 = a + b_3 x_3 + b_1 x_1 + b_5 x_5 + b_2 x_2 + b_6 x_6$	0.99*

*Significant at 5%.

Keeping other factors constant, sunshine period (h/day) showed negative correlation with AB severity in the present study. The prediction equation for pod infection in respect of yellow sarson and mustard are given below.

i. AB infection severity on

yellow sarson pod:

$$(Y_2) = 16.18 + (3.75 X_1) + (3.52 X_5) + (-4.23 X_6).$$

ii. AB infection severity on mustard pod:

$$(Y_2) = -316.24 + (10.84 X_1) + (-4.29 X_2) + (2.76 X_3) + (2.38 X_5) + (-2.62 X_6).$$

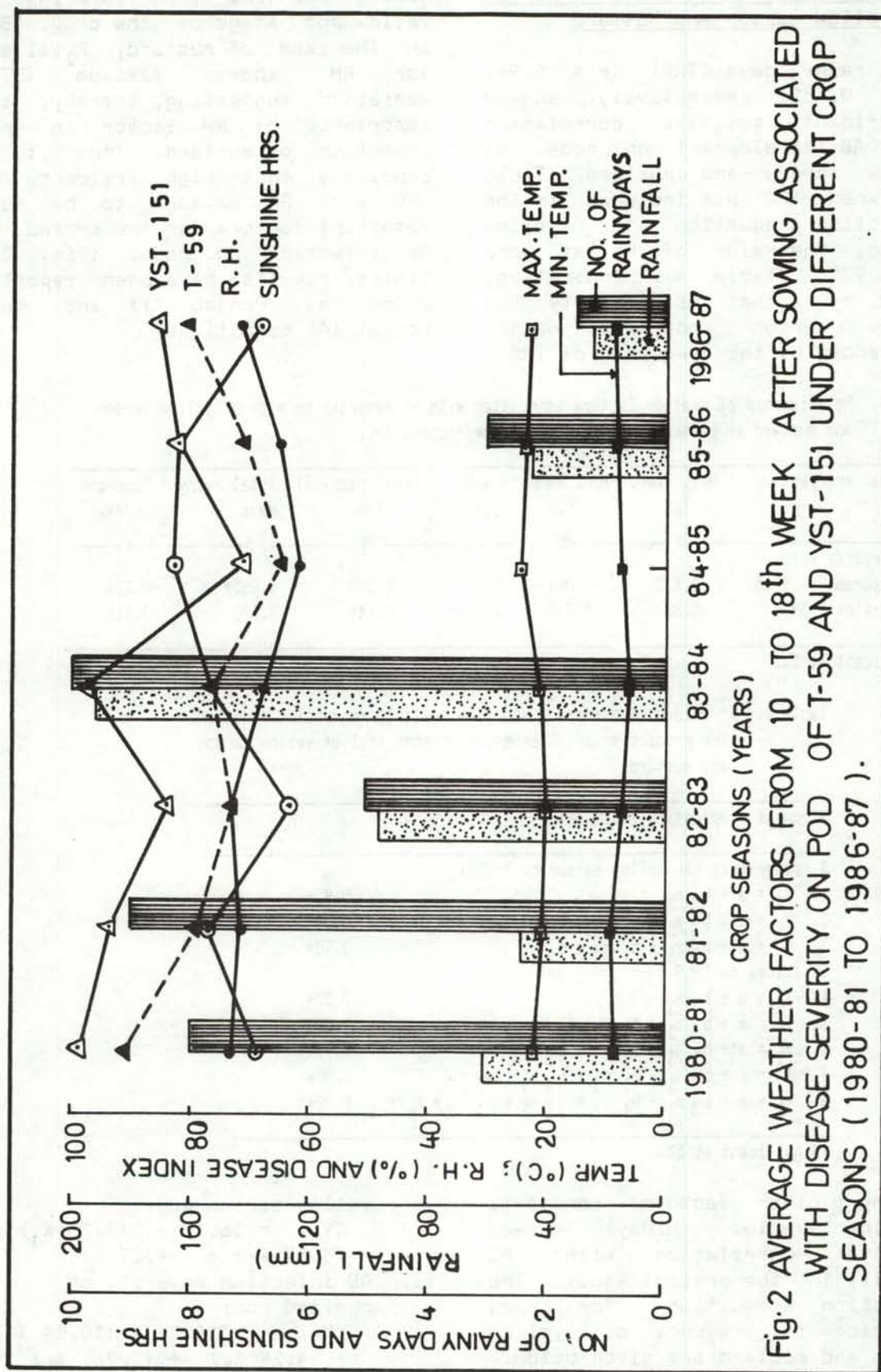


Fig.2 AVERAGE WEATHER FACTORS FROM 10 TO 18th WEEK AFTER SOWING ASSOCIATED WITH DISEASE SEVERITY ON POD OF T-59 AND YST-151 UNDER DIFFERENT CROP SEASONS (1980-81 TO 1986-87).

3. Relationship between age of the plant and susceptibility to AB

Plant age showed high degree of significant positive correlation with AB severity on leaf ($r = 0.777$ to 0.850) as well as on pod ($r = 0.980$ to 0.938). Maximum apparent infection rate ($ir = 0.763$) on leaf was observed between 10 and 12 weeks after sowing in the case of yellow sarson and mustard, indicating thereby the maximum susceptibility of the plants, beyond 60-90 days after sowing. Young plants, less than 30 days of age, did not show development of symptoms on the leaf under field conditions.

This suggests that with increase in the age beyond 30 days, the susceptibility of the crop increases and becomes at its peak at 60-90 days. This information, thus, becomes a useful guide for time of application of the fungicides for

maximum efficacy of the fungicidal control.

References

1. Chahal, A.S. and M.S. Kang. 1979. Influence of meteorological factors on the development of *Alternaria* blight of rape and mustard in the Punjab. *Indian Phytopath.* 32:171.
2. Kolte, S.J. 1985. Diseases of Annual Edible Oilseed Crops. Volume II. Rapeseed-Mustard and Sesame Diseases. CRC Press, Boca Raton, Florida, pp. 135.
3. _____, R.P. Awasthi and Vishwanath. 1987. Assessment of yield losses due to *Alternaria* blight in rapeseed and mustard, *Indian Phytopath.* 40:209-211.
4. Sarkar, B. and P.K. Sen Gupta. 1978. Studies on some aspects of the epidemiology of *Alternaria* leaf blight of mustard (*Brassica* spp.) *Beitrage zur Tropischen Landwirtschaft Und Vetrinar medizin* 46:91-96.
5. Snedecor George W. and William G. Cochran. 1967. *Statistical Methods*. Oxford and IBH Publishing Co., New Delhi, India, pp 593.
6. Van der Plank, J.E. 1963. *Plant Diseases: Epidemics and Control*. Academic Press, New York, London, 349pp.