PART-A) RESEARCH

I. TOBACCO RESEARCH STATION (TRS), MARDAN

1. CHEMISTRY SECTION

TITLE NO. 1 EVALUATION OF VARIOUS LEVELS OF NPK FERTILIZER ON FLUE-CURED VIRGINIA (FCV) TOBACCO FOR HIGH YIELD AND GRADE INDEX

Importance

Tobacco belongs to family Solanaceae and genus Nicotiana. The widely cultivated species of Nicotiana are (*Nicotiana tabacum* L. and *Nicotiana rustica* L.). All over the world these species are cultivated as cash crop. The quality and yield of FCV tobacco depend upon the soil texture, fertilization, depth of plough and nitrogen content of soil. The soils vary widely in physico-chemical properties and nutrients' profile which considerably influences the type, grade and quality of FCV tobacco. Higher sugar and lower nicotine are obtained by the application of 60 and 70kg Nitrogen/Hectare (Chari *et al.* 1994). Nitrogen increases the vegetative growth of plants. Soil rich in Phosphorus contents gave the highest cured leaf yield and quality of tobacco, if 112 kg N+112 kg P_2O_5 +112 kg K_2O/ha are applied. Potassium (K) balances the sugar-nicotine ratio and increases the yield and quality of tobacco (Hardter and Yuhong, 2000).

Objectives

- To study the effect of various formulations of NPK fertilizer on the yield and quality of FCV tobacco.
- To evaluate the high yielding and best quality formulation for tobacco growers.

Persons associated Chemistry Section TRS Khan Garhi, Mardan.

Duration 3 years

- Year of Initiation: 2020-2021
- Year of completion: 2022-2023
- This will be the 1st year of the research trial

Economic impact

Finding out proper formulation of NPK fertilizer to FCV Tobacco to:

- Increase yield
- Improve quality and grade index

Detail work plan Design: Split-plot Design with three replications and eight treatments.

S. No	Treatments Codes	Ratio	Kg/ha
		NPK	NPK
1.	T_0	12:12:18	60:60:90
2.	T_1	15:12:18	75:60:90
3.	T_2	17:12:18	85:60:90
4.	T_3	12:15:18	60:75:90
5.	T_4	12:17:18	60:85:90
6.	T_5	12:15:20	60:75:100
7.	T_6	12:17:20	60:85:100
8.	T_7	15:17:22	75:85:110

Variety K-399/PVH2310

Procedure

NPK fertilizer 28gm/plant will be applied in split doses. Half dose will be applied in first week after transplantation and the remaining half dose will be applied after stress period (re-ridging). All recommended agronomic practices will be applied.

Parameters to be studied

- Plant Height (cm)
- Leaf Area (cm^2)
- No of Leaves/plant
- Green weight (kg/ha)
- Cured weight (kg/ha)
- Reducing Sugar (%)
- Nicotine (%)
- Grade index
- Cost Benefit Ratio (CBR)

Requirements

Land, labour, fertilizer and pesticides etc. will be provided by Farm Manager, while soil and leaf analysis will be carried out at Chemistry laboratory of TRS Khan garhi, Mardan.

TITLE NO. 2 TO CHECK EFFICACY OF DIFFERENT PESTICIDES AND THEIR RESIDUAL EFFECT ON TOBACCO CROP

Importance

The use of insecticides and pesticides has increased during the past 3-4 decades and tobacco stakeholders/companies are also facing problems in export of tobacco due to pesticide residual effect. Pesticide residue refers to the pesticides that may remain on or in food after they are applied. The maximum allowable levels of these residues are often stipulated by regulatory bodies in many countries. Each country adopts their agricultural policies and Maximum Residue Limits (MRLs) and Acceptable Daily Intake (ADI).

Objectives

- To check the efficacy of pesticides (Insecticides, Fungicides, Herbicides & Fungicides).
- To check the residual effect of pesticides after 20 days of its application on green leaves and then after curing of FCV tobacco leaves.

Economic impact

Finding out efficient and below MRLs of pesticide for:

- Control of insects, pests and weeds
- Enhancement of tobacco export

Duration 3 years (2020-2023)

- Year of Initiation: 2020-2021
- Year of completion: 2022-2023.
- This will be the 1st year of the research trial.

Variety K-399/PVH2310

Design Randomized Complete Block Design (RCBD) with 8 treatments and 4 replications

Treatments

T_1: Cypermethrin 10% EC

T_2: Lufenuron 5% EC

T_3: Emamectin Benzoate 1.9% EC

T_4: Pendimethalin 330% EC

T_5: Metolachlor 960% EC

T_6: Flumetralin 12.5% EC

T_7: Carbendazim 50% WP

T_8: Control

Methodology of Pesticides Application

All pesticide will be applied on crop as per recommended dose rate/procedure and then the efficacy of each would be assessed.

Methodology to Check Residual Effect

Above mentioned pesticides, weedicides and suckericides will be applied on tobacco crop to control insects/pests, weeds and suckers of tobacco crop. Recommended doses of pesticides, weedicides and suckericides will be applied at different stages, according to requirement and attack of insects/pests. Green tobacco leaf samples will be analyzed for pesticide residues after 20 days of pesticides, weedicides and suckericides application. Similarly, residual effect of pesticides will be observed after curing on Gas Chromatograph. Collected samples will be shaked on shaker for 24 hours and then will be run on rotary evaporator to collect filtrate. Different methods (procedures) will be applied for the residue of each pesticide, weedicide and suckericide. Then data will be compared with MRLs.

Agronomic and chemical parameters will also be checked by chemistry section. These parameters are given below;

Parameters

1: Plant height (cm)
2: Leaf area (cm^2)
3: Green weight/plot (kg)
4: Cured weight/plot (kg)
5: No of green leaves/kg
6: No. cured leaves/kg
7: Pesticides efficacy
8: Pesticides residue

9: Chemical analysis of leaf

a. Nicotine contents (%)

b. Reducing sugar (%)

10: Cured yield (kg/ha)

Requirements

Land, labor, fertilizer and pesticides etc. will be provided by Farm manager, while leaf analysis (chemical, pesticides residues) will be carried out at Chemistry laboratory of TRS, Mardan.

Person Associated Chemistry Section/Plant Protection Section, TRS, Mardan.

TITLE NO. 3 SURVEY OF TOBACCO GROWING AREAS FOR EVALUATION OF SOIL PHYSICO-CHEMICAL COMPOSITION IN KHYBER PAKHTUNKHWA (KP)

Importance

Soil fertility plays an important role in the productivity of any crop. Soil test based fertilizer recommendation will help the farmers to optimize the resources and improve the productivity.

Objectives

- To update the soil survey report as carried out in 1984-85.
- To calculate the values of different parameters of soil (Texture, pH, EC, organic matter, available nitrogen, phosphorous, potassium and chloride).
- To recommend fertilizer doses for different tobacco zones.

Persons associated

Chemistry Section, Tobacco Research Station Khan Garhi, Mardan.

Economic impact

Finding proper physic-chemical composition of soil of tobacco growing areas and recommend fertilizer doses to:

- Update soil survey report of 1984-85
- Improve tobacco productivity
- Improve tobacco quality

Duration 3 years

- Year of Initiation: 2018-2019
- Year of completion: 2020-2021.
- This will be the 2rd year of the research trial.
  (In 2019-20 samples were not collected due to COVID-19 Pandemic)

Procedure

In order to assess various parameters of soil, soil samples will be collected from different tobacco cultivated zones and will be analyzed in Chemistry Section TRS Khan garhi, Mardan. Soil survey report will be updated.

Name of Station/Locality

TRS Khan garhi, Mardan.

Table-4 Survey of Tobacco Growing Areas for Evaluation of Soil Physico-chemical Composition in KP

District	Area	pH	Electrical Conductivity (dSm^{-1})	Organic Matter%	Nitrogen %	Available Phosphorus P_2O_5 ppm	Available Potash K_2O ppm	Texture
Mardan	*Shergrh*	7.6-8.2	0.31-0.53	0.27-0.61	0.04-0.10	5.40-12.48	58.00-120.00	Silt/silt Loam
	Takht Bhai	7.7-8.3	0.35-0.62	0.17-0.72	0.03-0.12	6.32-13.00	50.00-105.00	Silt/silt Loam
	Khan garhi	7.9-8.3	0.41-0.56	0.20-0.56	0.03-0.09	6.00-12.46	52.00-85.00	Silt/silt Loam
Charsada	*Mandani*	7.6-8.3	0.34-0.64	0.37-0.78	0.06-0.12	7.53-12.50	45.00-135.00	Silt/silt Loam
	Sardheri	7.7-8.2	0.44-0.67	0.28-0.69	0.04-0.11	8.23-13.97	67.00-140.00	Silt/silt Loam
Swabi	*Yar Hussain*	7.7-8.4	0.31-0.71	0.17-0.73	0.03-012	5.12-11.23	42.00-76.00	Silt/silt Loam
	Charbagh	7.5-8.1	0.26-0.72	0.27-0.84	0.04-0.13	4.56-10.44	48.00-95.00	Silt/silt Loam
	Chota Lahor	7.8-8.2	0.15-0.54	0.40-0.92	0.06-0.15	5.62-11.73	50.00-115.00	Silt/silt Loam
Buner	*Chamla*	7.0-7.9	0.30-0.67	0.34-0.83	0.05-0.14	6.00-13.40	70.00-112.00	Loam/ Sandy Loam
Mansehra	*Baffa*	6.9-7.8	0.19-0.51	0.38-0.78	0.06-0.12	7.45-14.02	65.00-105.00	Loam/ Sandy Loam

Table-4, showed that soil samples of the above areas of Mardan, Charsada, Swabi, Buner and Mansehra were analyzed for physico-chemical characteristics in 2018-19, while soil samples of some tobacco growing areas i.e Jamal Jarhi, Swat, Buner (Swari), Sharifabad, Mansehra etc. will be collected for analysis during 2020-21.

SUMMARY OF THE PREVIOUS WORK

Title No. 01 **Effect of Bio-Gas Slurry on the yield and quality of Nicotiana Rustica L. (White Patta)**

Treatments Codes	Treatments Kg/ha	
	NPK (60:60:90)	Bio-gas Slurry
T_0	400	0
T_1	200	500
T_2	200	1000
T_3	200	1500
T_4	200	2000
T_5	200	2500

Table No. 01 **Effect of Bio-Gas Slurry on the cured yield of Nicotiana Rustica L. (White Patta)**

Treatment	2017-18	2018-19	2019-20	Average
T_0	2146	2747	1926	2273
T_1	1843	2952	1648	2148
T_2	2290	2748	2204	2414
T_3	2599	3155	2328	**2694**
T_4	2275	3168	2070	2504
T_5	2462	2998	2278	2579

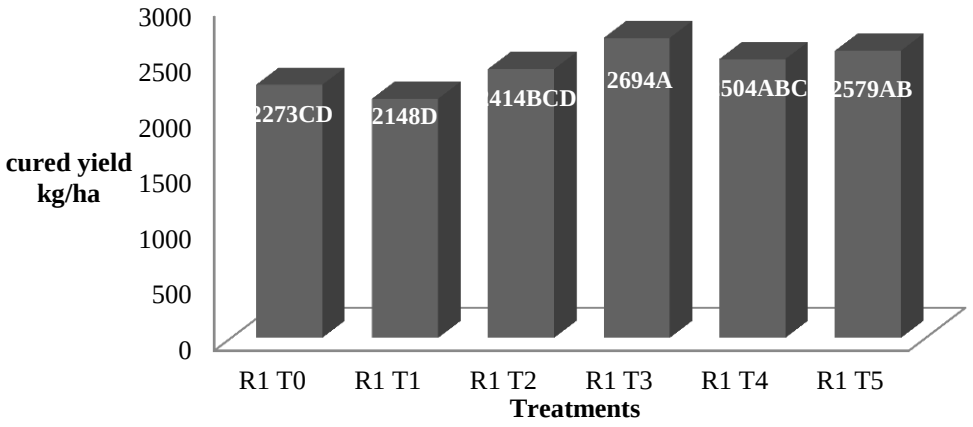

Figure No. 1 The effect of different treatments on the cured yield of *Nicotiana Rustica* L.

The Figure 1, showed that there is significant difference between means of different treatments ($\alpha = 0.05$). The highest cured yield 2694kgha^{-1} was observed at T_3 (200+1500kg/ha) which was 200kg/ha NPK (12:12:18) and 1500kg/ha bio-gas Slurry. It is concluded that if 200kg (4bags) NPK with ratio (12:12:18) and 1500kg/ha biogas slurry applied to *Nicotiana Rustica* tobacco it will give high yield.

Title No. 02 Effect of Farm Yard Manure (FYM) with Humic Acid (16kg/ha) and half dose of NPK (12:12:18) on yield and chemical composition of FCV tobacco

Treatments Codes	Treatments Kg/ha		
	NPK (60:60:90)	Humic Acid	FYM
T_0	500	16	0
T_1	250	16	1500
T_2	250	16	2000
T_3	250	16	2500
T_4	250	16	3000
T_5	250	16	3500

Table No. 02 Effect of Farm Yard Manure (FYM) with Humic Acid (16kg/ha) and half dose of NPK (12:12:18) on the cured yield of FCV tobacco

Treatment	2017-18	2018-19	2019-20	Average
T_0	3166	3692	2366	3075
T_1	3003	3519	2522	3015
T_2	2551	3409	2567	2842
T_3	2847	3855	2692	3131
T_4	3168	3853	2520	**3180**
T_5	2911	3804	2084	2933

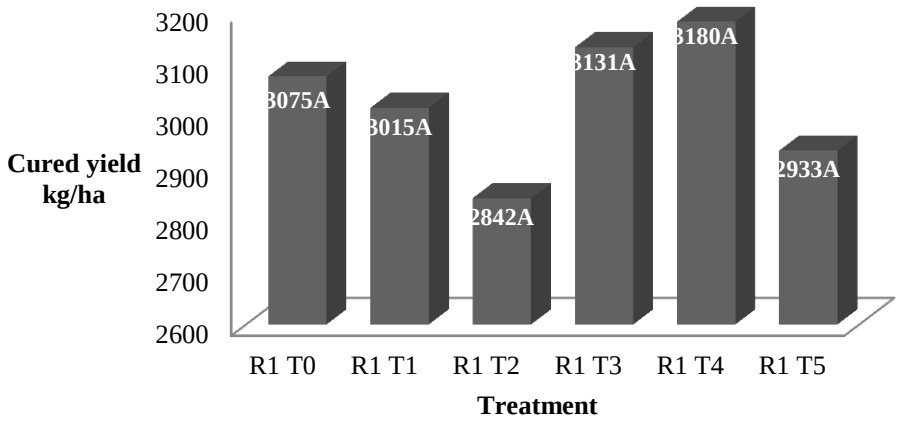

Figure No. 2 The Effect of different treatments on the cured yield of FCV tobacco

The Figure 02, showed that there is non-significant difference observed between means of different treatments (α = 0.05). The highest cured yield 3180kgha^{-1} was observed at T_4 (250+16+3000kg/ha) which was 250kg/ha NPK (12:12:18), 16kg/ha Humic Acid and 3000kg/ha FYM. It is concluded that if 250kg (5bags) NPK with ratio (12:12:18), 16kg/ha Humic Acid and 3000kg/ha FYM applied to FCV tobacco will give high yield.

Title No. 03 Effect of Organic Matter-Phosphate with various doses of Potash on yield and Biochemical composition of FCV tobacco

Treatments Codes	Treatments Kg/ha	
	Organic matter Phosphate	Potash
T_0	150	0
T_1	150	25
T_2	150	50
T_3	150	75
T_4	150	100
T_5	150	125

Table No. 03 **Effect of Organic Matter-Phosphate with various doses of Potash on yield and Biochemical composition of FCV tobacco**

Treatment	2017-18	2018-19	2019-20	Average
T_0	3276	3389	1980	2882
T_1	3333	3430	2704	3156
T_2	3785	3677	2911	**3458**
T_3	3542	3605	2918	3355
T_4	3086	3446	2490	3007
T_5	3138	3746	2376	3087

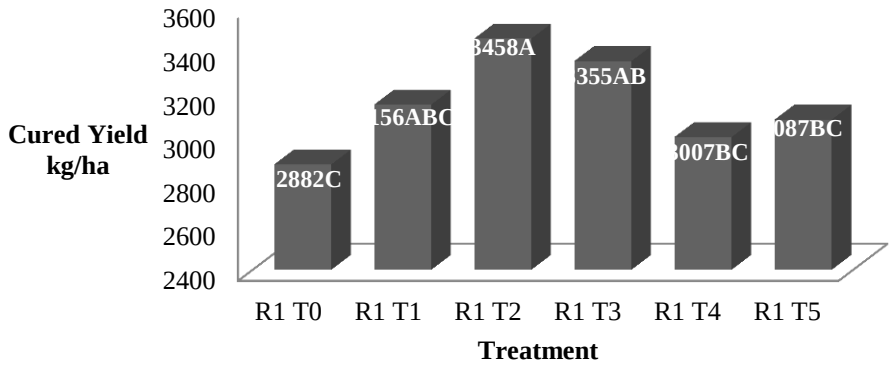

Figure No. 3 **The Effect of different treatments on the cured yield of FCV tobacco**

The Figure 03, data showed that there is significant difference between means of different treatments ($\alpha = 0.05$). The highest cured yield 3458kgha^{-1} was observed at T_2 (150+50kg/ha), which was 150kg/ha Organic matter: Phosphate (35:25) and 50kg/ha Potash. It is concluded that 150kg/ha Organic matter: phosphate ratio (35:25) and 50kg/ha SOP applied to FCV tobacco will give high yield.

2. BOTANY SECTION

A. PLANT BREEDING (FCV)

TITLE NO 1 **PERFORMANCE OF FCV EXOTIC HYBRIDS UNDER AGRO-CLIMATIC CONDITIONS OF KP**

Tobacco industry is always striving to introduce new hybrids from exotic region in order to fulfill the requirement of tobacco growers and to boost the economy of country by exporting good quality tobacco. However, prior to any recommendation, hybrids are tested under different ecological conditions of KP region for their adaptability and agronomic performance.

Planting Material

(I) Keeping in view the above factor, 6 FCV hybrids (as provided by PTC) 17x199, 17x102, RJR-213, RJR-217, RJR-215 & RJR-901 including one conventional check cultivar (Spt. G-28/K-399).

Duration 2019-22 (This will be the 2nd year of trial)

(II)

A) Keeping in view the above factor, 1 FCV hybrid (as provided by PTC) NC-938 including one conventional check cultivar (Spt. G-28/K-399).

B) Keeping in view the above factor, 1 FCV hybrids (as provided by PMPKL) PVH-2329 including one conventional check cultivar (Spt.G-28/K-399).

Duration 2018-21 (This will be the 3rd year of trial)

Statistical Design Randomized Complete Block Design (RCBD) with four replications

Plant to plant distance: 2ft, Row to Row distance: 3ft

Parameters to be studied

- Plant height after topping (cm)
- No. of leaves plant^{-1}
- Leaf Size (cm^2)
- Days to Flowering
- Days to Maturity
- Green Weight Plot^{-1} (kg)
- Green Leaves Kg^{-1}
- Cured Weight Plot^{-1} (kg)
- Cured Leaves Kg^{-1}
- Cured Yield Hectare^{-1} (kg)

- Disease Incidence (%)
- Grade Index (%)
- Nicotine (%)
- Reducing Sugar (%)

Location Tobacco Research Station (TRS), Mardan

Staff Botanist and Breeding Staff at TRS Mardan

RESULTS OF PREVIOUS YEARS WORK

Treatment/ Variety PM(PK)L	Yield (Kg/ha) 2017-18	Yield (Kg/ha) 2018-19	Yield (Kg/ha) 2019-20	Mean	Nicotine (%) 2017-18	Nicotine (%) 2018-19	Nicotine (%) 2019-20	R. Sugar (%) 2017-18	R. Sugar (%) 2018-19	R. Sugar (%) 2019-20
PVH-1600	3144	3975	2756	3292	2.23	3.17	2.37	15.18	17.43	13.36
PVH-2275	2857	3974	2403	3078	2.13	2.84	2.52	13.25	16.04	14.60
PVH-2340	2591	3542	2160	2764	2.66	2.86	2.51	15.17	17.35	15.78
PVH-2324	2446	3562	2018	2675	2.25	2.75	2.77	15.47	14.78	15.10
Spt. G-28	2619	3137	1838	2531	2.12	2.85	2.46	14.15	16.14	12.07

The above mean table reveals the significant difference of yield among FCV hybrids and Spt. G-28. Overall results proved that PVH-1600 was found to be the best hybrid under the agro-climatic conditions of Mardan.

RESULTS OF PREVIOUS YEAR WORK

Treatment/Variety (PTC)	Yield (Kg/ha) 2018-19	Yield (Kg/ha) 2019-20	Nicotine % 2018-19	Reducing Sugar % 2018-19	Nicotine % 2019-20	Reducing Sugar % 2019-20
NC-938	2900	2593	2.64	14.78	2.32	14.08
K-399	3496	2365	2.84	16.17	2.77	14.26

Treatment/Variety (PMPKL)	Yield (Kg/ha) 2018-19	Yield (Kg/ha) 2019-20	Nicotine (%) 2018-19	Reducing Sugar (%) 2018-19	Nicotine (%) 2019-20	Reducing Sugar (%) 2019-20
PVH-2329	3502	2415	2.23	12.14	2.62	15.83
K-399	2813	2365	2.72	15.16	2.77	14.26

Treatment/Variety (PTC)	Yield (Kg/ha) 2019-20	Nicotine (%) 2019-20	Reducing Sugar (%) 2019-20
17x199	2122	2.47	14.62
17x102	2376	2.51	15.8
RJR-213	3058	2.49	15.09
RJR-217	2574	2.67	14.06
RJR-215	3003	2.42	15.29
RJR-901	2293	2.36	13.38
K-399	2365	2.77	14.26

TITLE NO. 2 **EVALUATION OF RECOMBINANT HOMOZYGOUS LINES AS COMPARED TO STANDARD VARIETIES FOR DEVELOPMENT OF FCV VARIETIES**

Importance Locally made four crosses were led to F_7 generation in 2015. Single plant selection was made for vigorous growth, disease free and drought tolerance. Single plant selection was made for vigorous growth traits. The eight recombinant homozygous lines will be evaluated for candidate varieties.

Objectives Development of our own local varieties with higher yield, better quality and well-adapted to local conditions.

Duration 2020-21 (This will be the 6^{th} year of trial)

Material Eight recombinant homozygous experimental lines, Spt. G-28 and K-399.

Design RCBD with four replications

Persons associated Breeder: Dr. Qaizar Ahmed and Assistant Botanist at TRS, Mardan

Staff Breeding Section

Parameters to be studied

1. Plant height after topping (cm)
2. Number of leaves $plant^{-1}$
3. Leaf area (cm^2)
4. Green weight $plot^{-1}$ (kg)
5. Cured weight $plot^{-1}$ (kg)
6. No. of green leaves kg^{-1}
7. No. of cured leaves kg^{-1}
8. Days to Flowering
9. Days to Maturity
10. Cured Yield $Hectare^{-1}$ (kg)
11. Nicotine (%)
12. Reducing sugar (%)

RESULTS OF PREVIOUS YEARS WORK

Treatments	Yield (Kg/ha) 2018-19	Yield (Kg/ha) 2019-20
E1	2895	2817
E2	2513	2167
E3	3029	2544
E4	2588	2147
E5	3070	2124
E6	2680	2476
E7	3239	2212
E8	2598	1895
Spt. G-28	3137	1788
K-399	2906	2544

B. RUSTICA TRIALS

TITLE NO 1 **RUSTICA VARIETAL EVALUATION TRIAL**

Objective To check the performance of 10 Rustica varieties under agro-climatic conditions of Mardan for various physiological parameters.

Plant Material

(I) 04 Rustica varieties viz; Rustica Swabi, Rustica-18, Rustica Bubak, Rustica 9 in addition to Rustica-13 as a check cultivar.

(II) 04 Rustica varieties viz; Rustica Rasoolabad, Rustica -19, Rustica Jampur, Rustica Hazro in addition to Rustica-14 as a check cultivar.

Experimental Design RCBD with four replications having plant to plant and row to row distance of 30 and 45 cm respectively.

Responsible Officers Rustica Botanist and Assistant Botanist

Location TRS, Khan Garhi Mardan

Duration 2018-21 (This will be the 3rd year of trial)

Parameters to be studied

1. Plant Height (cm)
2. No. of Leaves $Plant^{-1}$
3. Leaf Area (cm^2)
4. Green Weight $Plot^{-1}$(Kg)
5. Green Leaf Kg^{-1}

6. Cured Weight Plot^{-1} (Kg)
7. Cured Leaf Kg^{-1}
8. Cured Yield Hectare^{-1} (Kg)
9. Nicotine (%)
10. Reducing Sugar (%)

RESULTS OF PREVIOUS YEARS WORK (I)

Treatment/ Variety	Yield (Kg/ha) 2018-19	Yield (Kg/ha) 2019-20	Nicotine (%) (2018-19)	Nicotine (%) (2019-20)	Reducing Sugar (%) (2018-19)	Reducing Sugar (%) (2019-20)
Rustica-9	2991	2644	2.13	2.97	4.45	5.43
Rustica Bubak	2884	2102	2.49	2.93	4.67	5.67
Rustica-13	2986	3287	2.7	3.04	4.82	5.30
Rustica Swabi	2008	1675	2.36	2.96	4.32	5.55
Rustica-18	3074	3254	4.41	3.01	4.73	5.79

RESULTS OF PREVIOUS YEARS WORK (II)

Treatment/ Variety	Yield (Kg/ha) 2018-19	Yield (Kg/ha) 2019-20	Nicotine (%) (2018-19)	Nicotine (%) (2019-20)	Reducing Sugar (%) (2018-19)	Reducing Sugar (%) (2019-20)
Rustica Rasoolabad	2241	1934	2.88	3.02	5.76	5.40
Rustica Hazro	2528	3177	2.36	3.01	4.86	5.66
Rustica-19	3098	1896	2.39	3.07	4.98	5.80
Rustica Jampur	2217	1785	2.66	2.98	5.03	5.50
Rustica-14	2806	3181	2.31	3.00	4.25	5.61

TITLE NO 2 **RUSTICA SEED PRODUCTION PLOT**

In order to multiply the seed of Rustica standard variety Rustica 13 & Rustica 14 with maximum genetic purity, the seed production plot will be raised in Tobacco Model Farm Buner.

3. PLANT PROTECTION SECTION

A) PLANT PATHOLOGY

The following research studies will be carried out during 2020-21

TITLE NO. 1 SURVEY OF TOBACCO DISEASES, SAMPLING AND DISEASE MAPPING IN TOBACCO CULTIVATING AREAS OF KP

Importance

Survey of any locality or area is helpful to make a surveyor updated regarding various factors around that area. Disease survey also have same advantage as it makes the pathologists updated about the disease occurrence in a particular area and also help in record making and appropriate management of disease thus helps farmers to gain maximum yield of tobacco.

Objectives

- To assess the prevalence of various diseases infecting tobacco in tobacco producing areas of KP.
- To find out the appropriate avoidance strategy against those diseases.
- To develop a disease prevalence map for farmer awareness.

Person Associated Assistant Plant Pathologist

Duration 3 years

i. Year of initiation : 2018-2019

ii. Year of completion : 2020-2021

iii. This will be the 3rd year of the trial

Requirements

1. Labor (manpower)
2. Sampling bags
3. Transport

Parameters

1. Disease incidence (%) will be recorded in each observed area.
2. Disease severity (%) will be recorded in each observed area.
3. Disease prevalence will be determined based on above-mentioned parameters.

Detailed work plan

1. Survey

An extensive survey of tobacco growing areas of KP will be carried out in field at seed bed stage and in field to monitor the occurrence/spread of various tobacco diseases in area assessing the extent and nature of damage by these diseases. Data will be recorded on disease incidence, severity and prevalence.

2. Laboratory Tests

Disease specimens of tobacco plant and soil will be collected from different localities for identification of their casual organisms in the laboratory by using various diagnostic methods.

Results

Areas under surveillance for determining the incidence of tobacco diseases in District Mardan and Charsadda, KP

Five farmer fields from each area under consideration were selected to estimate the incidence of various tobacco diseases. For this purpose, soil and infected plants of incident area were collected. The incidence of various diseases in district Mardan was as follows:

Areas under surveillance for determining the incidence of tobacco diseases in District Mardan and Charsadah, KPK

		Soil Sample					Plant Sample				
		Fungi	Bacteria	Nematode	Virus	Weather Fluctuation	Fungi	Bacteria	Nematode	Virus	Weather Fluctuation
1.	Pir Abad	YES	NO	NO	NO	NO	YES	NO	NO	YES	YES
2.	Said Abad	YES	NO	NO	NO	NO	YES	YES	NO	NO	NO
3.	Srekh Banda	NO	NO	YES	YES	NO	NO	NO	YES	YES	YES
4.	Karimoo	YES	NO	NO	NO	NO	YES	NO	NO	YES	NO
5.	Amir Abad	YES	NO	YES	NO	NO	YES	NO	YES	NO	NO
6.	Sharif Abad 1	YES	NO	YES	NO	NO	YES	YES	NO	NO	NO
7.	Sharif Abad 2	NO	YES	NO	NO	NO	NO	YES	NO	YES	YES
8.	Haji Abad	NO	NO	YES	NO	NO	NO	NO	NO	YES	YES
9.	Behloldera	NO	NO	NO	NO	NO	YES	NO	NO	NO	YES
10.	Tomboolak	YES	YES	NO	NO	NO	NO	NO	NO	NO	YES

Economic Impact

This experiment will help in proper mapping of diseases thus appropriate management strategies will become easy to apply which will help in reducing the application cost of farmers.

TITLE NO. 2 **BIOLOGICAL CONTROL OF DAMPING OFF DISEASE IN TOBACCO THROUGH *TRICHODERMA* SPP. IN COMBINATION WITH CHEMICAL CONTROL AT TOBACCO RESEARCH STATION (TRS) MARDAN**

Importance

Biological control is environment friendly approach and application of Bio-control Agent (BCA) helps in reducing environmental toxicity and reducing cost per unit fulfilling the Integrated Pest Management (IPM) criterion. Using biological control can help in reducing the chemical application which indirectly affects biodiversity.

Objectives

- To check the efficacy of biological control agent *Trichoderma* spp. and chemical (Matalaxyl-M + Mancozeb) against Damping off disease.
- Comparative analysis of both treatments in separate as well as in combination.

Person Associated: Assistant Plant Pathologist

Duration 3 years

i. Year of initiation : 2018-2019

ii. Year of completion : 2020-2021

iii. This will be the 3rd year of the trial

RESULTS OF PREVIOUS YEAR WORK

At Seedling Stage

S.No.	Treatments	Diseased Plants (%) 2018-2019	Diseased Plants (%) 2019-2020
1.	Matalaxyl-M + Mancozeb	3%	2.66%
2.	*Trichoderma harzanium*	*2.33%*	2%
3.	(Matalaxyl-M + Mancozeb) + *Trichoderma harzanium*	**1.33%**	**1%**
4.	Control	5%	5.66%

After 1st Spray

S.No.	Treatments	Diseased Plants (%) 2018-2019	Diseased Plants (%) 2019-2020
1.	Matalaxyl-M + Mancozeb	5.55%	3.33%
2.	*Trichoderma harzanium*	*4.44%*	6.66%
3.	(Matalaxyl-M + Mancozeb) + *Trichoderma harzanium*	**3.33%**	**2.22%**
4.	Control	6.66%	6.66%

After 2nd Spray

S.No.	Treatments	Diseased Plants (%) 2018-2019	Diseased Plants (%) 2019-2020
1.	Matalaxyl-M + Mancozeb	4.44%	2.22%
2.	*Trichoderma harzanium*	*3.33%*	2.22%
3.	(Matalaxyl-M + Mancozeb) + *Trichoderma harzanium*	**2.22%**	**1.11%**
4.	Control	5.55%	5.55%

After 3rd Spray

S.No.	Treatments	Diseased Plants (%) 2018-2019	Diseased Plants (%) 2019-2020
1.	Matalaxyl-M + Mancozeb	4.44%	2.22%
2.	*Trichoderma harzanium*	*2.22%*	**1.11**%
3.	(Matalaxyl-M + Mancozeb) + *Trichoderma harzanium*	**1.11%**	**1.11%**
4.	Control	5.55%	3.33%

The above results showed that maximum disease control was observed with T_3 (Mixture of Ridomil Gold + *Trichoderma harzanium*) while minimum disease control was observed with T_1 (Ridomil Gold).

Economic Impact

- This project will open a new spectrum to tackle the disease damages for tobacco growers. Moreover, it will also help to minimize the chemical expenditure of chemical control and reduce the toxicity of chemicals in end-product.

Requirements

1. Land
2. Labor (manpower)
3. Fertilizers
4. Curing
5. Soil testing
6. BCA pure culture
7. Plant analysis
8. Chemical
9. Culture Media

Parameters

1. Disease incidence (%) will be recorded for each treatment
2. Disease decrease over control (%) will also be examined

Experimental Layout

1. For field trial, Randomized Complete Block Design (RCBD) will be applied
2. Four replications will be carried out

Detailed Work Plan

1. Bio-control agent (*Trichoderma harzianum*) will be multiplied on Potato Dextrose Agar (PDA) and then its effective concentration will be tested against soil-borne fungi on PDA.
2. Effective concentration will be applied in field.
3. Recommended dose of chemical will be tested in field.
4. Combination of both BCA (at effective concentration) and chemical (recommended dose) will be tested under field conditions for effective reduction of damping-off fungi.

TITLE NO. 3 **EVALUATION OF FUNGICIDES AGAINST SOIL BORNE DISEASES OF TOBACCO SEED BED**

Importance

Chemical control via fungicides is the quick response management strategy against onset fungal diseases which reduces the incidence of disease below economic threshold level (ETL).

Objective

- To test the efficacy of fungicides against soil borne diseases under natural conditions.

Person Associated: Assistant Plant Pathologist

Duration 3 years

i. Year of initiation : 2020-2021

ii. Year of completion : 2022-2023

iii. This will be the 1st year of the trial

Treatments

1. Copper hydroxide
2. Pyraclostrobin
3. Pyraclostrobin + Boscalid
4. Control

Requirements

1. Land
2. Labor (manpower)
3. Fertilizers
4. Curing
5. Plant analysis
6. Fungicides

Parameters

1. Disease incidence (%) will be recorded for each treatment.
2. Disease decrease over control (%) will also be examined.

Experimental Layout

- For this trial, RCBD will be applied.
- Four replications will be done.

Detailed Work Plan

1. Available fungicides for soil borne diseases will be collected and their solutions at recommended doses will be prepared.
2. Fungicides will be sprayed in diseased plot with an interval of 15 days.
3. After every 15 days, disease incidence will be examined.

Economic Impact

This project will follow a curative approach and help to minimize the disease damage for tobacco growers. Moreover, it will also help to minimize the expenditure of chemical control with lesser number of sprays.

B. ENTOMOLGY

TITLE NO. 1 **PRODUCTION OF *SITOTROGA* CEREALELLA EGGS FOR THE REARING OF PARASITOID (*TRICHOGRAMMA SPP.*) USED TO CONTROL LEPIDOPTRAN INECT/PESTS OF TOBACCO CROP**

Importance

Tobacco crop plays a pivotal role in the economy of Pakistan. The problem of insect-pest is acute in Tobacco crop. The use of insecticides and pesticides has increased manifolds during the past 3-4 decades and tobacco stakeholders/companies are also facing problem in export of tobacco due to pesticide residual effect. Pesticides or chemicals are meant to control harmful pests such as insects, nematodes, diseases, weeds etc. However, excessive use of pesticides leave residues in soil, plants and air but also have adverse effects on the non-target organisms such as pollinators, parasitoids, predators and wild animals, which have adversely affected the ecological balance.

Objectives

The overall objective of biological insect pest control is to manage pests and adopting Integrated Plant Protection Management (IPPM) strategy with special emphasis on augmentation of different beneficial insects in the laboratory, their subsequent releases in the field and ultimately their conservation in the field on sustainable basis. Biological control helps in:

- Reducing pollution, health hazards and increasing biodiversity
- Reducing overall 1 to 2 sprays against targeted pest

Methodology

1. Firstly, wheat grains will be washed to remove dust and other commodities, and then grains will be spread in tray and left until its dryness.
2. 1gm eggs of *Sitotroga* spp. spread in stainless steel tray (24"x 18") on 3 kg wheat grains.
3. Tray will be kept at 25-30^{o}C till hatching of eggs.
4. After 3 weeks grains will be transferred in plastic jars for the emergence of adults.
5. Plastic jar will be observed on daily basis and the resultant moths (adults) will be emptied into special cylinder coated with a wire screen with fine pores that allow the eggs to pass through and prevent escape of any moth.
6. All collected eggs will be pasted on cards and put in jars where *Trichogramma* spp. female parasitoids the eggs of host for the next use in field for biological control of Bud worm and Army worm population.

Duration

- Year of Initiation: 2020-2021
- This will be the 1st year of the research trial

Persons Associated

Assistant Entomologist/Plant Protection Section

TITLE NO. 2 **PERFORMANCE OF DIFFERENT INSECTICIDES FOR THE CONTROL OF APHID**

Variety K-399

Design

RCB design with 4 treatments and 4 replications

Treatments

T_1: Flonicamide (ulala) 50% WG

T_2: Acetamiprid 20% SP

T_3: Dinotefuran (oshin) 20 SG

T_4: Control

Methodology

Data will be recorded as below mentioned detail

- Five plants will be selected randomly.
- Leaf from middle, bottom and top will be selected and count per leaf insect eggs, larvae and adults.

Insects will be count before Insecticide application

- After 24 hours of Insecticide application
- After 48 hours of Insecticide application
- After 72 hours of Insecticide application

Objectives

- Comparison of new chemistry pesticides with acetamiprid for the control of Aphid.

Person's Associated

Assistant Entomologist/Plant Protection Section

Duration

This will be the 1st year of this trial (2020-2023)

SUMMARY OF THE PREVIOUS WORK

Title No. 1: Performance of different insecticides with neem extract mixture for the control of cut worm

A trial was conducted at TRS Mardan, to check the performance of different insecticides with neem extract mixture against Cut worm on Flue Cured Virginia Tobacco. Three treatments along with control were used to conduct the trial. Treatments were arranged in RCBD with three replications, detail is mentioned below:

Sr. No.	Treatments	Dilution Factor (Pesticide X Water)
1	Jatara 10 % EC (Bifentrin)	30 ml x 10 ltrs
2	Alpha Cypermethrin 10 % EC	40 ml x 10 ltrs
3	Neem Extract Mixture	2.5 ltrs x 10 ltrs
4	Control	-

Statistical analysis showed that all insecticides had capability to control Cut worm attack as compared with the treatment plot where no insecticide applied. The results among these treatments showed that Jatara 10% EC (Bifenthrine) controlled 78% Cut worm attack on FCV tobacco. While other treatments (insecticides) Alpha Cypermethrin and Neem extract gave 57% and 55%, respectively (Table No.1).

Conclusion

Three years results data showed that Jatara 10 % EC (Bifentrin) gave best control against cut worm as mentioned below. So, it is recommended that Jatara 10 % EC (Bifentrin) may use for the better management/control of cutworm in FCV tobacco field

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Sr. No	Treatments	(Control %) 2017-18	(Control %) 2018-19	(Control %) 2019-20
1	Jatara 10 % EC (Bifentrin)	**77**	**75**	**84**
2	Alpha Cypermethrin 10 % EC	70	56	57

3	Neem Extract Mixture	42	50	55
4	Control	-	-	-

Title No. 2 Performance of different insecticides with neem extract mixture for the control of bud worm

A trial was conducted at Tobacco Research Station Mardan to evaluate the efficacy of different Insecticides and neem extract against Bud worm on Flue Cured Virginia Tobacco. Three treatments (Insecticides) along with control were used to conduct the trial. Treatments were arranged in RCBD with 3 replications. Detail of treatments is mentioned below

Sr. No.	Treatments	Dilution Factor (Pesticide X Water)
1	Emamectin Benzoate 1.9 %EC	25 ml x 10 ltrs
2	Flubendamide 48% SC	30 ml/acre
3	Neem Extract Mixture	2.5 ltrs x 10 ltrs
4	Control	-

Statistical analysis of data revealed that all insecticides had ability to control the insect pest (Bud worm) attack, as compared to control treatment plot (no insecticide treatment applied).

Best results among the insecticides were given both by Flubendamide (80%) and Emamectin Benzoate (78%) to control Bud worm, while Neem extract mixture gave 66.4% control against bud worm attack (Table No.2).

Conclusion

Three years results data revealed that both Emamectin Benzoate 1.9% EC and Flubendamide 48% SC gave better control results against bud worm as mentioned below. So, it is recommended that both Emamectin Benzoate 1.9% EC and Flubendamide 48% SC can be used for control of budworm in agro-climatic field conditions.

Sr. No	Treatments	(Control %) 2017-18	(Control %) 2018-19	(Control %) 2019-20
1	Emamectin Benzoate 1.9% EC	**87.5**	**75**	78
2	Flubendamide 48% SC	67	75	**80**
3	Neem Extract Mixture	67	64	66
4	Control	-	-	-

Title No. 3 Performance of different insecticides with neem extract mixture for the control of aphid

A trial was conducted at Tobacco Research Station (TRS), Mardan to check the efficacy of different insecticides against Aphid on FCV Tobacco. Three treatments (insecticides) along with control were used to perform the trial. Treatments were arranged in RCBD with three replications. Detail of treatment is mentioned below,

Sr. No.	Treatments	Dilution Factor
1	Imidacloprid (25% WP)	20 grams x10 ltrs
2	Acetamiprid (20% SP)	15grams x 10 ltrs
3	Neem Extract Mixture	2.5 ltrs x 10 ltrs
4	Control	-

After collection of pre and post treatment data, statistical analysis showed that all insecticides had ability to control Aphid attack. After application of insecticides, data has been collected after 24, 48, 72 hours to check the mortality rate of Aphid.

Statistical analysis showed that after 24 hours of insecticide application, best result was given by Acetamiprid (82.10%). While Imidacloprid and Neem extract were gave 78.84% and 52.03% control respectively (Table No.3).

After 48 hours of insecticides treatment data revealed that mortality percentage of Aphid increased to 85.2% in Acetamiprid treatment plot. While mortality percentage increased to 85% and 67.4% in Imidacloprid and Neem extract mixture plot, respectively (Table No.3).

Insecticides mortality results after 72 hours showed that mortality percentage increased to 86% in Acetamiprid treatment plot. While mortality percentage increase to 85.9% and 71% in Imidacloprid and Neem extract mixture treatment plot respectively (Table No.3).

Conclusion

Efficacy trial of pesticides for aphid control data revealed that Acetamiprid (20% SP) gave better control against Aphid as year wise mentioned below. So, it is recommended that Acetamiprid (20% SP) can be used for control of Aphid in agro-climatic field conditions.

Sr. No	**Treatments**	**(Control %) 2017-18**	**(Control %) 2018-19**	**(Control %) 2019-20**
1	Imidacloprid (25% WP)	85.24	82.02	85.90
2	Acetamiprid (20% SP)	**86.8**	**83.5**	**86**
3	Neem Extract Mixture	81.9	72.8	71
4	Control	-	-	-

4. PHYSIOLOGY SECTION

Objectives

Following are the main objectives of Physiology section at Tobacco Research Station (TRS), Mardan:

1. To streamline the advance tobacco production technology.
2. To improve quality and per unit yield.
3. To uplift the socio-economic status of farming community.
4. To save foreign exchange incurred or import for domestic consumption.
5. To earn foreign exchange through export.

TITLE NO. 1 TO CHECK THE EFFECT OF DIFFERENT TRANSPLANTATION DATE ON TOBACCO CONVENTIONAL VARIETIES

Tobacco (*Nicotiana tobacum* L.) is a cash crop not only in Khyber Pakhtunkhwa but also in Punjab, grown for cigarette production. Tobacco is one of the few plants entering into the world trade entirely on leaf basis and most commonly grown commercial non-food plant in the world (Yousafzai *et al*., 2007). Leaf is the major economic part of the crop, harvested for processing of cigarette industry. As a researcher our main purpose is to increase the yield and quality by following conventional practices at low cost with high productivity through best technical services for farmers. Many factors are involved in boosting the required purpose of researcher for farmers, among them one is proper date of sowing of tobacco. The optimum time for transplanting of Tobacco to the field is usually recommended in early and mid-March, but due to weather fluctuation since last few years these varieties are required to set the proper sowing date to get good yield and quality. It is obvious that climate change has a direct impact on tobacco Productivity.

Climate change is defined as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere"

Climate variability and change in the Globe also affects the sector of industry, health, politics, and social economic. In agricultural sector, climate change affects not only on its resources, but also on its infrastructure, production system, and security. As a country that has a basic sector of agricultural, climate change has affected agricultural productivity. As delaying or

even early transplanting decreased yield, returns, total alkaloids, hexane extracts, lamina weight and percent lamina. Delaying transplanting also increased the chlorophyll content of the leaf but had no effect on reducing sugars, and only reduced grade index late in the planting season. Enhancing tobacco farmers' resilience capacity is important. Moreover, lack of accessibility to climate information unable tobacco farmers to predict the precise time to plant and harvest the tobacco.

For this purpose a field experiment was conducted to evaluate the optimum transplantation date in RCBD split plot design replicated thrice having four treatments with two conventional varieties. In previous two years research data, Visual differences in tobacco at different transplanting dates were clearly visible in the field throughout the growing season. At harvest, part of these differences was a reflection of variation in the color of the leaf. The chlorophyll content of harvested green leaves was normally greater at the early transplanting than late. In short, delaying transplanting decreased yield as well as quality.

Varieties

Following two varieties will be sown:

1. K 399
2. Spt-G28

Treatments

T_1: Last week of February

T_2: 15 March

T_3: 2nd week of April

T_4: Last week of April

$R_1V_1T_1$	$R_2V_1T_1$	$R_3V_1T_1$
$R_1V_1T_2$	$R_2V_1T_2$	$R_3V_1T_2$
$R_1V_1T_3$	$R_2V_1T_3$	$R_3V_1T_3$
$R_1V_1T_4$	$R_2V_1T_4$	$R_3V_1T_4$
$R_1V_2T_1$	$R_2V_2T_1$	$R_3V_2T_1$
$R_1V_2T_2$	$R_2V_2T_2$	$R_3V_2T_2$
$R_1V_2T_3$	$R_2V_2T_3$	$R_3V_2T_3$
$R_1V_2T_4$	$R_2V_2T_4$	$R_3V_2T_4$

Design

Spilt Plot design with three replications

Objective

- To check the response of different FCV varieties on variable transplantation date.
- To set the optimum days for sowing for specific variety.

Person Associated

Assistant Physiologist

Parameters

1: Plant height (cm)
2: Leaf area (cm^2)
3: Green weight/plot (kg)
4: Cured weight/plot (kg)
5: No of green leaves/kg
6: No. cured leaves/kg
7: Chemical analysis of leaf
    c. Nicotine contents (%)
    d. Reducing sugar (%)
8: Total yield/ha (kg)

Duration

This will be the 3rd year of this trial

LAST YEAR RESULTS TABLE

Treatments	Yield (kg/ha)	Nicotine (%)	Reducing Sugar Contents (%)
V_1T_1	**2862**	2.80	13.43
V_1T_2	2526	2.44	14.06
V_1T_3	1636	2.47	14.43
V_1T_4	1140	2.78	12.77
V_2T_1	2380	2.62	14.61
V_2T_2	**2974**	2.32	13.84
V_2T_3	1496	2.77	14.43
V_2T_4	1240	2.92	13.83

The above table revealed that maximum yield was observed with V2T2 (Spt G-28 2974 kg/hac) transplanted on 22-03-2019

TITLE NO. 2 **TO CHECK DROUGHT TOLERANCE AMONG CONVENTIONAL FCV TOBACCO VERITIES AND DIFFERENT HOMOZYGOUS LINES**

Importance

Tobacco is an agriculturally important Solanaceae crop and is one of the most studied plants as biological model system. Drought is one of the major constraints in crop production and affects 64% of the global land area. It is the most common cause of severe food shortage in developing countries. In order to improve drought responses in tobacco and other Solanaceae species, it is desirable to understand how these plants respond to drought stress at multiple levels in the plant. This allows a better understanding of primary and secondary

metabolism and the interplay between transcriptional, posttranscriptional, translational and posttranslational regulation. However, there are few reports on metabolic changes in tobacco during drought stress and systems biology data that combine results from multiple different levels in the same samples appear to be lacking. Tobacco is a tropical crop in origin but it is grown in subtropical and temperate regions of the world.

The crop needs around 28°C as an optimum temperature for germination but it may germinates at a temperature ranging between 15°C to 35°C The crop cannot withstand frost and starts withering or wilting at a temperature above 35°C. Tobacco needs 50-100 cm rainfall which should be well distributed throughout growing period. Areas having a rainfall of more than 125 cm are not fit for tobacco production, whereas a rainfall of less than 75 cm results in production of leathery leaves having very high nicotine content in them. The leaves remain smaller and possess very poor burning quality.

In dry and hot season irrigation is done at the interval of 15 days . After first are second irrigation stress is necessary for the tobacco crop, in this condition the root and leaf well develop.

As above, Water Scarcity is a major issue in these days globally which also affect the agriculture sector very much in the crops yield as well as its quality. So, there is also a need in tobacco to introduce/establish a variety which has ability to grow in severe drought condition. Therefore the following trial is designed in RCBD with three replications having ten treatments to evaluate the level of drought tolerance among these lines and FCV varieties as well as to find out drought tolerant variety of tobacco.

Objective

- To check the level of drought tolerance among different available line and conventional FCV varieties.
- To check the effect of drought conditions on yield and chemical properties of tobacco.
- To find out drought tolerance variety of tobacco.

Varieties

Following varieties and homozygous lines will be sown:

1	K-399
2	SPT-G-28
3	E-1
4	E-2
5	E-3
6	E-4
7	E-5
8	E-6
9	E-7
10	E-8

Design

RCBD design with four replications

Person Associated

Assistant Physiologist

Parameters

1: Plant height (cm)
2: Leaf area (cm^2)
3: Green weight/plot (kg)
4: Cured weight/plot (kg)
5: No of green leaves/kg
6: No. cured leaves/kg
7: Chemical analysis of leaf
    a. Nicotine contents (%)
    b. Reducing sugar (%)
8: Total yield/ha (kg)

Duration

This will be the 3rd year of trial

LAST YEAR RESULTS TABLE

Treatments	Yield (Kg/ha)	Nicotine Contents %	Reducing Sugar (%)
E1	2220	2.67	14.26
E2	2134	2.51	15.16
E3	2252	2.51	14.99
E4	**2430**	2.76	13.65
E5	1855	2.55	15.18
E6	2012	2.37	13.84
E7	2070	2.58	14.49
E8	2253	2.68	13.83
Spt G-28	2224	2.69	15.08
K-399	2320	2.60	16.04

Conclusion:

The above table revealed that maximum yield was observed in E4 (2340 kg/ha) in somehow drought conditions.

TITLE NO. 1 RUSTICA TOPPING HEIGHT TRIAL

Introduction:

Tobacco inflorescence is one of the dormant bud which reduces the yield and quality of the tobacco crop. Topping is an essential cultivating measure for tobacco, which shifts the plant from reproductive to vegetative phase. Topping and desuckering are two most important methods in tobacco crop production, Suckers develop in tobacco plants from the shoots. The unwanted suckers grow with tobacco plants after topping and compete for food,

light, moisture and space so nutrient and yield can be improved in these plants by practicing these techniques otherwise these nutrients will be consumed by inflorescence and suckers.

Topping stimulates root growth, the source of nicotine, which improves drought tolerance. In addition, topping and suckering of tobacco plant are used to improve growth, yield and quality of upper leaves, larger size and weight, increased alkaloid levels and cleanness from insects. The plant also stands firmer because of increased root growth and trimmed top. It stimulates the production of secondary plant products that accumulate in the leaves. These products give the cured leaf improved quality and smoking characteristics. Topping lowers the population of several insects that are attracted to the plant by the flowers due to alkaloid contents. Whenever the tobacco are topped late, there will be increase in the number of pre-topping suckers which must be removed to improve Morphology, Physiology, and Chemistry of a tobacco plant.

A field experiment will be carried out on the "comparative effect of topping height on yield and quality of Rustica tobacco" at the Tobacco Research Station, Khan Garhi, Mardan, using randomized complete block design replicated thrice. Treatments included (T1: 10 leaves, T_2 :12 leaves, T_3: 14 leaves) by sowing one conventional variety of Rustica 13, with following detail:

Variety Rustica-13

Treatments T_1: 10 leaves

T_2: 12 leaves

T_3: 14 leaves

Design RCBD with three replications

Objective

- To set the optimum stage for topping of Rustica crop.
- To determine difference in yield and chemical properties of cured leaves by varying the height of topping.

Person Associated

Assistant Physiologist

Parameters

1: Plant height (cm)

2: Leaf area (cm^2)

3: Green weight/plot (kg)

4: Cured weight/plot (kg)

5: No of green leaves/kg

6: No. cured leaves/kg

7: Chemical analysis of leaf

   a. Nicotine content (%)

   b. Reducing sugar (%)

8: Total yield/ha (kg)

Duration

This will be 3rd year of this trial

LAST YEAR RESULTS TABLE

Treatments	**Yield (kg/ha)**	**Nicotine (%)**	**Reducing Sugar Contents (%)**
T_1 (10 leaves)	3288	3.14	5.50
T_2 (12 leaves)	3528	3.18	5.57
T_3 (14 leaves)	**3840**	**3.24**	**5.69**

The above table revealed that maximum yield was observed in T_3 (3840 kg/ha).

5. AGRONOMY SECTION

TITLE NO. 1 **EFFECT & COMPARISON OF MANUAL HOEING AND CHEMICAL WEEDICIDE CONTROL ON PRODUCTION OF TOBACCO (FCV)**

Importance: Agriculture is the mainstay of Pakistan's economy. Its share in GDP is 24%. Tobacco production in Pakistan has long tradition and for many families it is the basic source of living. Tobacco makes a significant contribution in different sectors of the economy. Weeds compete with crop plants for nutrients, soil moisture, space and sunlight and hence reduce yield. Most of the weeds are more competitive than the crop plants. Reduction in tobacco yield has a direct correlation with weed competition. Generally, an increase in one kilogram of weed growth corresponds to a reduction in one kilogram of crop growth. Therefore, to find out the most suitable method of weed control is very important.

Objectives

- To evaluate the cost of production of different weed control methods
- To compare cured yield of FCV tobacco by adopting different weeds control methods

Persons associated Agronomy Section, Tobacco Research Station, Mardan.

Duration Three years.

i) Year of initiation: 2018 – 2019.
ii) Year of completion: 2020 – 2021.

This will be the 3rd year of the trial.

Economic impact After finding the proper optimum/economical method of weed eradication as well as reduced labor cost and high FCV tobacco production, we will be able to produce export quality tobacco on low cost to contribute national economy.

Detailed Work Plan The experiment would be conducted in RCB design with three replications.

Treatments

T_1: Control
T_2: Manual Hoeing (Three times in whole growing season)
T_3: Mechanical Hoeing (Two times)
T_4: Pre-Emergence Herbicide (STOMP 330 EC)
T_5: Post Emergence Herbicide (Topik 15WP)
T_6: Pre-Emergence Herbicide (STOMP 330 EC) in 1st irrigation after re-ridging

Sources

a. STOMP 330 EC + Topik 15WP
b. NPK

Variety

Speight G-28.

Procedure

Hand hoeing will be done by labors. There will be 3 hand hoeing practices throughout the growing season at 15 DAT, 45 DAT and 75 DAT (days after transplanting). Mechanical hoeing will be done two times before re-ridging. Pre-emergence herbicide will be applied before the transplantation of seedling in the field. Topik 15 WP herbicide for narrow leaf weeds will be applied after transplanting at 15 DAT, 45 DAT and if possible at 75 DAT. Pre-emergence herbicide (1.5 liter/ha) will be applied in 1st irrigation after re-ridging. Recommended Fertilizer will be applied within a week after transplantation. All approved cultural practices and plant protection measures will be adopted.

Parameters to be studied

Yield data will be recorded and leaf samples will be analyzed for nicotine and reducing sugar.

Requirements

Land, labor, fertilizers and pesticides etc. will be provided by farm manager, while soil and leaf analysis will be carried out at chemistry laboratory of Tobacco Research Station, Mardan.

Parameters

1. Weed Density per m^2
2. Weed biomass gm per m^2
3. Plant height (cm)
4. Number of leaves per plant
5. Leaf Area (cm^2)
6. Cured weight per plot (kg)
7. Yield per hectare (kg)
8. Nicotine percentage (%)
9. Reducing sugar percentage (%)
10. Cost Benefit Ratio (CBR)

SUMMARY OF THE PREVIOUS WORK

TITLE NO. 1 EFFECT & COMPARISON OF MANUAL HOEING AND CHEMICAL WEEDICIDE CONTROL ON PRODUCTION OF TOBACCO (FCV)

Treatment	Weeds Density (m^{-2})	Weed Biomass ($gm.m^{-2}$)	Plant height (cm)	No of Leaves /plant	Leaf area (cm^2)	Cured Yield (kg/ha)	Nicotine %	R. Sugar %
Control	181	766.3	93	17	634.97	2243	2.03	11.58
Manual	76	130.5	106	20	714.08	2725	2.69	14.34
pre-emergence	111	185.8	105	19	740.27	2550	2.49	13.38
post emergence	126	276.1	102	18	662.11	2117	2.32	13.16
Mechanical Hoeing	67	121.2	106	21	674.55	2845	2.13	13.24
Pre-emergence after stress period	53	110.5	108	21	727.18	2749	2.45	12.16

Table-1, showed that minimum Weed Density $53m^{-2}$ and Weed Biomass $110.5gm/m^2$ was observed in pre-emergence weedicide application after stress period, followed by Mechanical Hoeing $67m^{-2}$ and $121.2gm/m^2$ and maximum value was observed in control $181m^{-2}$ and 766.3 gm/m^2. Similarly, maximum cured yield 2845kg/ha was observed in mechanical hoeing, followed by 2749 kg/ha in pre-emergence weedicide application after stress period and minimum cured yield 2117 kg/ha was observed in post-emergence weedicide application.

TITLE NO. 2 EVALUATION OF ECONOMICAL AND BEST GROWTH CULTURE MEDIA FOR TOBACCO SEEDLINGS IN SEEDLING TRAYS

Importance

It is undisputed that healthy growing seedlings are the basis of a good tobacco crop. To improve tobacco production; good agricultural practice, which involves the implementation of new technologies for production of tobacco seedlings are necessary. Float Tray system technology of tobacco seedlings production is one of the key prerequisites for quality production. During the vegetation, a large number of factors have an impact on the tobacco that allow or interfere on the tobacco plant to express its biological and production potentials. Except the biological potential of the varieties, the largest influences have taken scientific farming methods and agro ecological conditions during the growing season. Tobacco growers must begin with production of healthy seedlings, in order to achieve good quality and high yield per unit area. The high-quality seedlings are produced with Float Tray System technology, production

which presents hydroponic system of growing tobacco seedlings on sterile substrate in medium with fertilizers and protection. The tobacco seedlings are quite uniform according to their morphological and biological characteristics, especially when tobacco has been transplanted on the field. Tobacco in the field depends on its well-developed root system and morphological uniformity in terms of its dimensions (Pearce & Palmer, 2005).The float system, besides being eco-friendly, is associated with many other benefits including a reduction in seed bed area and water requirement, more efficient use of fertilizers, and the production of superior robust seedlings that can better withstand harsh transplanting/Agro climatic conditions.

Objectives

- To evaluate/comparison of different nutrients Medias in trays for better growth of tobacco seedlings
- To obtain healthy and weeds free Seedling for high yield
- To reduce the Cost of Production on Seed beds

Persons associated Agronomy Section, TRS, Mardan.

Duration Three years

i. Year of initiation: 2019 – 2020
ii. Year of completion: 2021 – 2022

This will be the 2nd year of the trial.

Economic impact Best economical media for tobacco seedling growth will be evaluated for the benefit of tobacco growers, which will reduce the Cost of production and results in high yield. Seedling without roots damage and soil ball will reduce the diseases attack on tobacco crop.

Detailed Work Plan The experiment would be conducted in RCB design with four replications.

Treatments

T_1: Control: Normal Seed bed
T_2: Coco Peat
T_3: Slurry+ Soil: (50:50)
T_4: Slurry: 100%
T_5: Baggass ash+ Soil: (50:50)
T_6: Baggass ash+ Soil: (30:70)
T_7: Rice Hull

Variety Speight G-28

Procedure Trial will be conducted in first week of December at time of nursery sowing. Bio-slurry will be analyzed for its nutrients profile. $CuSO_4$ and Champion WP will be treated with treatments and trays will be prepared according to the ratio as mentioned above. Float bed will be prepared at suitable place. Water and $CuSO_4$ will be applied till germination of seedlings. After germination, Water will be removed from bed to avoid fungal attack on seedlings. Trays will be irrigated and fertilizer will be applied after 10 to 15 days till transplantation according to need of seedlings. The data will be recorded for below mentioned parameters.

Requirements Land, labor, fertilizers and pesticides etc. will be provided by farm manager, while soil and bio-slurry analysis will be carried out at chemistry laboratory of TRS, Mardan.

Parameters

1. Diseases attack in trays
2. Weed density per ft^2
3. Weed biomass per ft^2
4. Germination percentage

TITLE NO. 2 **EVALUATION OF ECONOMICAL AND BEST GROWTH CULTURE MEDIA FOR TOBACCO SEEDLINGS IN SEEDLING TRAYS**

Table No. 1 **Disease attack in trays**

Date	Normal Seedbed	Cocopeat	FYM	FYM+Soil	Slurry	Slurry+ Soil	Rice Hull	Wheat Straw
01-01-2020	Nil	Nil	Damping off	Damping off	Nil	Nil	Nil	Stunted growth
06-01-2020	-do-	-do-	Moderate	Moderate	-do-	-do-	-do-	-do-
10-01-2020	-do-	-do-	-do-	-do-	-do-	-do-	-do-	-do-
17-01-2020	-do-	-do-	High	High	-do-	-do-	-do-	-do-
23-01-2020	-do-	-do-	-do-	-do-	-do-	-do-	-do-	No seedling

Damping off disease was observed in FYM and FYM+Soil Nursery.

Table No. 2 Weed Density per ft^2

Date	Normal Seedbed	Cocopeat	FYM	FYM+Soil	Slurry	Slurry+ Soil	Rice Hull	Wheat Straw
01-01-2020	20	0	2	1	0	0	0	0
06-01-2020	30	0	2	1	0	0	0	0
10-01-2020	30	0	2	2	0	0	0	0
17-01-2020	35	0	3	3	0	0	0	0
23-01-2020	40	0	0	4	0	1	0	0

Weed density per ft^2 was maximum in Normal seed bed

Table No. 3 Weed Biomass gm/ft^2

Date	Normal Seedbed	Cocopeat	FYM	FYM+Soil	Slurry	Slurry+ Soil	Rice Hull	Wheat Straw
23-01-2020	4	0	0	0.02	0	0.01	0	0

Weed biomass gm/ft^2 was maximum in Normal seedbed followed by FYM+Soil used.

Table No. 4 Germination started on January 01, 2020

Date	Normal Seedbed	Cocopeat	FYM	FYM+Soil	Slurry	Slurry+Soil	Rice Hull	Wheat Straw
01-01-2020	60%	50%	2%	4%	10%	15%	20%	0%
06-01-2020	65%	70%	30%	45%	55%	62%	60%	30%
10-01-2020	72%	75%	46%	50%	70%	71%	72%	35%
17-01-2020	83%	82%	65%	63%	81%	83%	82%	37%
23-01-2020 Refilling	Nil	100%	100%	100%	100%	100%	100%	0%

From Table-4, it is cleared that after 20days (01-01-2020) of seed sowing in different media maximum germination 60% was recorded in normal seed bed followed by cocopeat, which is 50%. Above 80% germination was recorded in Normal Seedbed, Cocopeat, Slurry, Slurry+Soil and Rice hulk. Refilling was done in all medias except Wheat straw which has low germination.

Table No. 5 Nursery growth

Date	Normal Seedbed		Cocopeat		Farm Yard Manure		FYM+Soil		Slurry		Slurry+Soil		Rice Hull		Wheat Straw	
	Height Inches	No. of leaves	Height Inches	No. of leaves	Height Inches	No. of leaves	Height Inches	No. of leaves	Height Inches	No. of leaves	Height Inches	No. of leaves	Height Inches	No. of leaves	Height Inches	No. of leaves
03-02-20	0.5	3	0	2	0	2	0	2	0	2	0	2	0	2	0	2
17-02-20	1.3	5	1	4	0.6	3	0.7	3	0.9	4	0.8	4	1.2	4	0	2
02-03-20	4	6	3	6	1	4	1.3	4	2.6	6	2.9	6	3.2	6	0	0
16-03-20	5	8	4.5	7	0	0	0	0	4.8	7	4.2	7	4.8	7	0	0

Table-5 showed that maximum height of 5inches was recorded in Normal Seedbed followed by Rice Hull and Slurry and minimum was noted in FYM, FYM+Soil and Wheat Straw. Similarly, the maximum no of leaves i.e. 8 were recorded in Normal seed bed and same no of leaves i.e., 7 leaves were recorded in Cocopeat, Slurry, Slurry+Soil and Rice Hull. And zero number of leaves in FYM, FYM+Soil and Wheat Straw were observed.

II. TOBACCO RESEARCH SUB STATION (TRSS), MANSEHRA

1. CHEMISTRY SECTION

TITLE NO. 1 EFFECT OF DIFFERENT DOSES AND SPLIT APPLICATION OF NITROGEN ON THE YIELD AND QUALITY OF FCV TOBACCO

Importance

Mansehra occupies Sub Mountain and rain fed area and its annual rainfall is above 1200mm. Due to that high rainfall and sub-mountain area the plant nutrient specially nitrogen would be lost through leaching. Deficiency of nitrogen resulted in pale yellow leaves, thin stem and stunted growth of tobacco. Nitrogen plays key role in the development of tobacco plant. An excess of nitrogen produces tobacco leaf rich in protein, total nitrogen and nicotine.

Considering these points, a field experiment will be conducted to find out the nitrogen dose by the split application for the yield and quality of FCV tobacco.

Objectives

To study the effect of different doses and split application of nitrogen on the yield and quality of tobacco crop, this research trial would be under taken at the Tobacco Research Substation (trss), Mansehra.

Personnel Associated

Chemistry section of tobacco research substation Mansehra.

Duration 2nd year

Economic Impact

Mansehra is rain fed and sub mountain area due to these nitrogen losses through leaching will occur. To compare the efficiency of different doses of nitrogen fertilizer application will help to find out the proper doses of N for sub mountainous area to enhance the nutrient use efficiency and increased yield of tobacco crop.

Detailed Work Plan

The experiment will be laid out in randomized complete block design with different doses i-e 0, 20, 40, 60, 80, 100 and 120kgha^{-1} with three replications.

The different treatments will be as follows.

T_1: Tcontrol
T_2: 40 kgha^{-1}
T_3: 60 kgha^{-1}
T_4: 80 kgha^{-1}
T_5: 100 kgha^{-1}
T_6: 120 kgha^{-1}
T_7: 140 kgha^{-1}

Source Ammonium sulphate
Single Super Phosphate
Sulfate of Potash.

Variety Speight G28 / K399.

Procedure Recommended basal dose of phosphorus, potash and first split application of Nitrogen will be applied within a week after transplantation and remaining nitrogen will be applied before flowering stage. All the approved cultural and plant protection measures will be adopted.

Parameters to be studied

1. Plant height (cm)
2. Leaf area (cm^2)
3. Number of leaves plant^{-1}
4. Green weight plot^{-1}
5. Green leaves kg^{-1}
6. Cured weight plot^{-1}
7. Cured leaves kg^{-1}
8. Cured yield ha^{-1}
9. Nicotine %
10. Reducing sugar %
11. Cost Benefit Ration (CBR)

Soil Analysis

Before transplanting and after harvesting of tobacco in field soil will be analysed EC, pH, Organic matter, Nitrogen (N), Phosphorus (P_2O_5) and Potash (K_2O).

Leaf Analysis

After harvesting of tobacco, Nicotine (%) and Reducing Sugar (%) will be analyzed.

Requirements

Land, labor and inputs will be provided by the Farm Manager TRSS Mansehra. The samples will be analyzed at the chemistry laboratory.

TABLE: PREVIOUS / LAST YEAR DATA MENTIONED IN FOLLOWING TABLE

Treatment	Fertilizer Dose ($kgha^{-1}$)	Yield $kgha^{-1}$
T_1	0	1850
T_2	20	1941
T_3	40	2032
T_4	60	2035
T_5	80	2063
T_6=	100	2142
T_7	120	2253

Maximum Yield was obtained from T_7 followed by T_6

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2. BREEDING SECTION

TITLE NO. 1 FIELD EXAMINATION OF FCV HYBRIDS

Importance

Exotic genotypes will be grown as candidate varieties on the basis to check the performance for maximum yield production and good quality attributes. Plant introduction lead to introduce new genotypes in country through process of selection.

Objectives of the study

Hybrids of FCV Tobacco will be tested in Agro ecological conditions of Mansehra for examining the yield and quality attributes.

Hybrid varieties **17x199, 17x202, RJR213, RJR217, RJR215, RJR901, NC938, K399, Spt.G.28**

Persons associated Assistant Research Officer TRSS, Mansehra.

Year of experiment 2020-21

Methodology The experiment will be laid out in RCBD in three replications Row to Row and Plant to Plant distance will be maintained as recommended.

Characters to be studied

1. Days to 50% flowering
2. Days to 90% maturity
3. Plant height (cm)
4. Leaf Area (cm^2)
5. Number of leaves $plant^{-1}$
6. Green leaves kg^{-1}
7. Cured leaves kg^{-1}
8. Yield $hacter^{-1}$
9. Nicotine content
10. Reducing sugar content

Requirements Land, labour and fertilizer will be provided by farm manager and all chemical analysis are subjected to analyze by Assistant Chemist, Tobacco Research Sub-Station, Mansehra.

TITLE NO, 2 **EVALUATION OF RECOMBINANT HOMOZYGOUS LINES AS COMPARE TO STANDARD VARIETIES FOR DEVELOPMENT OF FCV VARIETIES**

Importance

Locally made four crosses were led to F_7 generation in 2015. Single plant selection was made for vigorous growth, disease free and drought tolerant. The eight recombinant homozygous lines will be evaluated for candidate varieties.

Objectives Development of our own local varieties with higher yield, better quality and well adapted to local conditions.

Duration 2019-20 (This will be the 5^{th} year of trial)

Material Eight recombinant homozygous experimental lines, Spt. G-28 and K-399.

Design Randomized Complete Block Design with three replications

Personnel Associated Breeder: Dr. Qaizar Ahmed and Botany Section

Parameters to be studied

1. Plant height before topping (cm)
2. Number of leaves per plant
3. Leaf area (cm^2)
4. Green weight per plot (kg)
5. Cured weight per plot (kg)
6. No. of green leaves/kg
7. No. of cured leaves/kg
8. Cured Yield per hectare (kg)
9. Nicotine %
10. Reducing sugar %

3. AGRONOMY SECTION

TITLE **EFFECTS OF DIFFERENT TRANSPLANTING DATES ON THE RODUCTION OF FLUE-RURED VIRGINIA (FCV) TOBACCO IN MANSEHRA REGION**

Importance

Agriculture contributes 18.5 percent to country's Gross Domestic Product (GDP) and provides 38.5 percent employment to national labour force. Tobacco makes a significant contribution in different sectors of the economy. Its total income contribution to GDP is Rs. 34 billion (4.7 % of the total GDP) in addition to foreign earning of Rs. 587 million by the cigarette manufactures. Climate has been changed and the raining pattern has been shifted forward in the Mansehra region. Climate change is affecting the cropping pattern of Pakistan. And we are following the same old planting dates for our conventional crops. It is directly affecting the production and ultimately the GDP of Pakistan. Therefore, it's a dire need of time to conduct research on the optimum transplanting date of FCV tobacco according to the climate of the Mansehra Region.

Objectives To evaluate the effects of climate change on the FCV tobacco production in Mansehra region, so that the optimum transplanting time would be recommended for the local farmers.

Persons associated Agronomy Section TRSS, Mansehra.

Duration Three years.

iii) Year of initiation: 2020 – 2021.

iv) Year of completion: 2022 – 2023.
This will be the 1st year of the trial.

Economic impact After finding the proper optimum transplanting date of FCV tobacco as well as high FCV tobacco production and reduced labor cost, we will be able to produce export quality tobacco on low cost to contribute national economy.

Detailed Work Plan The experiment would be conducted in RCBD design in Four (04) replications.

Treatments

T1: Control (Normal transplanting date)

T2: Early Transplanting (Before 10 Days)

T3: Late Transplanting (After10 Days)

T4: Late Transplanting (After 20 Days)

Sources

a) N.P.K. (11:11:18)

Variety K-399

Procedure Transplanting will be done by laborers. There will be 3 hand hoeing practices throughout the growing season at 15 DAT, 45 DAT and 75 DAT (days after transplanting). After randomly assigning plots to each treatment with the transplanting dates. Transplantation will be done according to its treatment. NPK will be the source of fertilizers for Nitrogen, phosphorus & potash application as basal dose. Fertilizer will be applied within a week after transplantation. All approved cultural practices and plant protection measures will be adopted.

Parameters to be studied

Yield data will be recorded and leaf samples will be analyzed for nicotine and reducing sugar.

Requirements Land, labor, fertilizers and pesticides etc. will be provided by farm manager, while soil and leaf analysis will be carried out at chemistry laboratory of Tobacco Research Sub-Station, Mansehra.

Parameters

The following parameters will be studied during the experiment:

1. Days to 50% Flowering
2. Plant Height after topping (cm)
3. Number of leaves per plant
4. Leaf Area (cm^2)
5. Number of green leaves per kg
6. Number of cured leaves per kg
7. Green weight per plot (kg)
8. Cured weight per plot (kg)
9. Yield per hectare (kg/ha)
10. Grade index (%)
11. Nicotine percentage
12. Reducing sugar percentage
13. Cost Benefit Ration (CBR)

III. TOBACCO MODEL FARM (TMF), BUNER

TITLE NO. 1 **RUSTICA VARIETAL TRAIL (ZONAL SUITABILITY TRAIL) (BOTANY SECTION)**

Objective:

To check the performance of five different Rustica varieties will be tested in Tobacco Mdel Farm (TMF), Buner.

Rustica Varieties

1 Rustica -13
2 Rustica -14
3 Rustica - 19
4 Rustica - Bubak
5 Rustica - Hazro

Location TMF Buner

Duration 2018 - 21 (This will be the 3rd year of trail)

The Rustica nursery will be provide by Farm Manager Tobacco Research Station Mardan

Transplantation will be carried out in the month of February 2020 at Tobacco Model Farm Ambela Buner. The systems of layout will RCBD. Three replications will be done.

Parameter to be studies

1. Plant height (cm)
2. Number of leaves /plant
3. Leaf area (cm^2)
4. Green Wight /plot (kg)
5. Number of Green leaves /kg
6. Number Cured Wight plot (kg)
7. Yield Per Hectare (kg / ha)
8. Nicotine (%)
9. Reducing Sugar (%)

Person of Associated: Farm Manager TMF Buner

and

Two Assistant Botanist TRS Mardan.

RESULT OF PREVIOUS YEAR

Treatment/ Verity	Yield (kg/ha) 2018-19	Nicotine % (2018-19)	Reducing Sugar % (2018-19)
Rustica Hazro	2096	3.11	4.83
Rustica -13	1816	3.14	5.09
Rustica -14	2236	3.04	4.76
Rustica -19	2032	3.26	5.25
Rustica Bubak	1536	3.18	5.21

The above mentioned table shows that Rustica-14 gave mix yield while minimum yield was recorded by Rustica Bubak.

TITLE NO. 2 **FLUE-CURED VIRGINIA (FCV) VARIETAL EVALUATION TRAIL**

The following FCV Varietal trail will be layout to check / compare the performance of local varieties' and Hybrid verities in TMF Buner 2020-21

Planting Material / Varieties

S.No	Verities
1.	Spt.G-28
2.	K-399
3.	CSC-447
4.	PVH-2310

Duration: 2019-22 (This will be the 2nd year of Trial)

The data of yield per hectare as compared to hybrid and conventional varieties, to check the quality and yield in Tobacco Model Farm Buner.

Parameter to Be Studies

1. Plant height (cm)
2. Leaves number /plant
3. Leaf Area (cm^2)
4. Green weight /plot (kg)
5. Cured weight /plot (kg)
6. Yield per hectare /kg

The hybrid nursery/seedling will be provided by Farm Manager Tobacco Research Station, Mardan. The Assistant Botanist/ARO will manage above mentioned research trial under the supervision of the Farm Manager, Tobacco Model Farm (TMF), Buner.

PREVIOUS HISTORY OF FCV VARIETAL TRAIL

Mean table of FCV Varietal Trail 2019-20

Treatments	***Plant Height cm sq***	***Leaf Area cm sq***	***Green leaf /kg***	***Green weight/plot***	***Cured leaf/kg***	***Cured weight/plot***	***Yield/Hec***	***Nic %***	***Reducing sugar %`***
CSC-447	*105*	*1041*	*39*	*32*	*238*	*5*	*2500*	*2.77*	*14.45*
PVH-2310	*102*	*1001*	*52*	*27*	*240*	*4.5*	*2250*	*2.84*	*17.65*
K-399	*102*	*995*	*40*	*22*	*227*	*3.5*	*1750*	*2.81*	*16.78*
Spgt-28	*87.5*	*998*	*49*	*23*	*240*	*3.6*	*1800*	*2.91*	*15.95*

The above mean data show that CSC-447 gave maximum yield 2500-kg/Hec while minimum yield was recorded in *K-399 1750-kg/Hec*

TITLE NO. 3 **FLUE CURED VIRGINIA (FCV) TOPPING HEIGHT TRIAL**

A field experiment will lay- out on the "comparative effect of topping height on yield and quality of FCV tobacco" at the Tobacco Model Farm Buner, the system of lay-out will be Randomized Complete Block Design with (RCBD) with three replications.

Variety K-399

Treatment: T_1 = 26 Leaves

T_2 = 24 Leaves

T_3 = 22 Leaves

Persons Associated: Farm Manager TMF Buner & Assistant Plant Physiologist TRS Mardan

Parameter to be studies

1. Plant height (cm)
2. Leaf area (cm^2)
3. Green weight per plot (kg)
4. Cured weight per plot (kg)
5. Number of Green leaf per /kg
6. Number of cured leaf (kg)
7. Grade index
8. Chemical analyses of leaf
   a) Nicotine content (%)
9. Reducing sugar (%)Total yield per hectare (kg)
   Duration: 2018 - 21 (This will be the 3rd year of trail)

PREVIOUS HISTORY

MEAN DATA OF TOPPING HEIGHT TRIAL 2019-20

DATA OF TOPPING HEIGHT TRIAL											
Varieties	***Treat.***	***Inter nodal(cm)***	***Plant height (cm)***	***Leaf area (cm^2)***	***Green leaves /kg***	***Green wt/plot***	***Cured leaves/ kg***	***Cured wt/plot***	***Yield kg/ha***	***Nic %***	***Reducing Sugar %***
K399 R-1 26-leaves	*T_1*	*3.8*	*106*	*492*	*20*	*38*	*231*	*6.2*	*3100*	*2.95*	*18.65*
	T_2	*4.01*	*105*	*482*	*21*	*36*	*218*	*5*	*2500*	*2.92*	*16.75*
	T_3	*4.7*	*103*	*398*	*23*	*35*	*222*	*5.5*	*2750*	*2.93*	*14.52*
R-2 24-leaves	*T_3*	*4.6*	*106*	*390*	*22*	*34*	*216*	*5*	*2500*	*2.90*	*13.85*
	T_2	*4.0*	*105*	*400*	*23*	*33*	*212*	*4.5*	*2250*	*2.93*	*15.27*
	T_1	*3.7*	*102*	*434*	*19*	*30*	*220*	*5*	*2500*	*2.96*	*13.88*
R-3 22-leaves	*T_1*	*3.7*	*106*	*440*	*22*	*32.5*	*220*	*4.5*	*2250*	*2.93*	*15.52*
	T_3	*4.3*	*104*	*431*	*19*	*30*	*228*	*4*	*2000*	*2.96*	*14.72*
	T_2	*4.01*	*105*	*398*	*21*	*31*	*219*	*5.5*	*2750*	*2.91*	*13.98*

The above mean table show that K-399 topping height treatment 26 leaves level gave mix yield, while min yield was recorded by 22 topping leaves.

MEAN DATA OF TOPPING HEIGHT TRIAL 2019-20

DATA OF TOPPING HEIGHT TRIAL											
Varieties	**Treat**	**Inter nodal (cm)**	**Plant height (cm)**	**Leaf area (cm^2)**	**Green leaves/kg**	**Green wt/plot**	**Cured leaves/ kg**	**Cured wt/plot**	**Yield kg/ha**	**Nicotine %**	**Reducing Sugar %**
K399 R-1	T_1	3.7	109	390	22	36	216	5	2250	2.91	13.44
	T_2	4.02	106	400	20	35	210	4	1800	2.07	12.72
	T_3	3.99	102	444	19	38	228	5.5	2250	2.77	15.52

R-2	T_3	4.00	102	510	23	37	222	6	2700	2.04	16.85
	T_2	4.01	101	484	21	36	216	5	2250	2.00	15.2
	T_1	3.5	105	495	20	39	234	7	3150	2.89	12.88
R-3	T_1	3.7	108	441	21	36	216	5	2250	2.7	13.44
	T_3	4.3	107	455	22	35	210	4	1800	2.8	15.29
	T_2	4.01	104	494	19	38	228	5	2250	2.7	14.88

The above mean table show that K-399 topping height treatment 24 leaves level gave maximum yield, while minimum yield was recorded by T_1 (26 leaves).

IV. TOBACCO MEDEL FARM (TMF) HAZRO, ATTOCK

TITLE NO. 1 RUSTICA (B.L) TOBACCO SPACING

1. Name of Station/Locality	Tobacco Model Farm Hazro, Attock
2. Importance	Different inter and intra line plant spacing tend to produce varying affect on yield and quality of Rustica Tobacco. Wider spacing tend to increase the production of medium and heavy bodied leaf while closer plant spacing promote diseases, insects, pests besides creating problem during inter culturing and application of insecticide/suckericide
3. Objective	To find out the optimum spacing for Rustica(B.L) tobacco
4. Person Associated	FM/ADO, Hazro, Attock
5. Year of initiation	2016-2017
6. Probable year of completion	2020-2021
7. Economic Impact	Identification of appropriate plant spacing for the production of better Rustica Tobacco (B.L), will be beneficial for the growers and the country as well.

8. Summary of previous Work

S.No	Spacings	YIELD (kgs/hec) 2016-17	YIELD (kgs/hec) 2017-18	YIELD (kgs/hec) 2018-19	YIELD (kgs/hec) 2019-20
1	45x30 cm	2380	The Trial's crop was damaged due to hailstorm and heavy rainfall	**2440**	The Trial's crop was damaged due to hailstorm and heavy rainfall
2	45x45 cm	**2460**		2390	
3	60x45 cm	2344		2340	
4	60x60 cm	2304		2270	

10. Detail Work Plan

Nursery for the trial will be raised at Tobacco Model Farm Hazro and transplantation of seedling will be carried out in February. The trial will be laid out in RCB Design with three repeats.

11. Treatments

Above mentioned trial will be conducted in four different spacings i.e.

T_1: 60cm x 45cm
T_2: 60cm x 30cm
T_3: 45cm x 45cm
T_4: 45cm x 30cm

12. Variety

R- Hazro

13. Parameters to be studied

i. Plant Height (cm)
ii. Number of leaves/plant
iii. Leaf Area (cm)
iv. No of green leaves/kg
v. Cured weight/plot (kgs)
vi. No of Cured leaves / kg
vii. Yield/Ha (Kgs)

14. Requirements

Land, Labor, Fertilizer, Pesticides, Suckericides etc will be provided by the Farm Manager/ADO

TITLE NO. 2 **DIFFERENT DATES OF TRANSPLANTATION (RUSTICA TOBACCO BLACK LEAF)**

1. Name of Station/Locality — Tobacco Model Farm (TMF) Hazro, Attock
2. Importance — It is imperative to find out optimum time for transplantation of Rustica Tobacco as the climatic condition significantly affects the growth of tobacco plant and ultimately its yield and quality.
3. Objective — To find out the optimum time for transplantation of Rustica (B.L) Tobacco in the respected area.
4. Person Associated — FM/ADO, Hazro, Attock
5. Year of initiation — 2016-2017
6. Probable year of completion — 2020-2021
7. Economic Impact — The aim of experiment is to find out optimum time of transplantation to obtain high yield with good quality attributes which will be beneficial for grower's community as well as the country.
8. Summary of Previous Work

S.No.	Date of Transplantation	Yield (Kg/ha) 2016-2017	Yield (Kg/ha) 2017-2018	Yield (Kg/ha) 2018-2019	Yield (Kg/ha) 2019-2020
1.	01-02	2128	The Trial's crop was damaged due to hailstorm and heavy rainfall	2180	The Trial's crop was damaged due to hailstorm and heavy rainfall
2.	07-02	2244		2244	
3.	11-02	2268		2370	
4.	18-02	2508		2410	
5.	21-02	**2572**		**2472**	
6.	28-02	2036		2130	

9. Detail Work Plan — Nursery for the trial will be raised at Tobacco Model Farm Hazro and transplantation of seedlings

will be carried out in February. The trial will be laid out in RCB Design with three repeats.

10. Treatments

S.No.	Date of Transplantation
1.	01-02
2.	07-02
3.	11-02
4.	18-02
5.	21-02
6.	28-02

11. Variety — R- 14

12. Parameters to be studied

i. Plant Height (cm)
ii. Number of leaves/plant
iii. Leaf Area (cm)
iv. No of green leaves/kg
v. Cured weight/plot (kgs)
vi. Cured leaf /kg
vii. Yield/Ha (kgs)

13. Requirements — Land, Labor, Fertilizer, Pesticides, Suckericides etc will be provided by Farm Manager/ADO

TITLE NO. 3 **CUTWORM CONTROL**

1. Name Of Station/Locality — Tobacco Model Farm (TMF) Hazro, Attock.

2.Importance — Cutworm is among the major insect pest of Tobacco crop. Cutworm is the nocturnal insect and cut the whole Rustica Tobacco plant from basal portion. If not controlled on time, eats up the whole plant and leads to 100% failure of the plant. The efficacy of Jatara and Alpha cypermetrin for better control of cutworm will be studied with comparison to control plots.

3. Objective — To assess comparative efficacy of Jatara and Alpha cypermetrine for the control of Cutworm.

4. Person Associated — FM/ ADO Hazro, Attock.

5. Year of initiation — 2019-20

6. Probable year of completion — 2021-2022

7. Economic Impact — The objective of the trial is to find out potential chemical for the control of cutworm. If this pest is controlled, quantity and quality of Rustica Tobacco will be improved and as a result will be beneficial for the growers and national economy.

8. Summary of Previous Work

S.No.	Insecticides	% control
1.	Jattara	70
2.	Alpha Cypermetrine	72
3.	Control	-

9. Detail Work Plan

Nursery for the trial will be raised at Tobacco Model Farm Hazro. The trial will be laid out in RCB Design with three repeats having inter and intra plant space of 45 cm and 30 cm. All other recommended cultural practices for tobacco will be followed.

10. Treatments

S. No	Name of Insecticide	Dose/Acre
T 1	Jatara 10% EC (Befinthrin)	450-500 ml/acre
T 2	Alpha Cypermetrin 10% EC	-do-
T 3	Control	---

11. Variety

R- Hazro

12. Parameters to be studied

i. Total No. of plants
ii. No. of attacked plants

13. Requirements

Land, Labor, Fertilizer, Pesticides, Suckericides etc will be provided by Farm Manager/ADO

PART-B) DEVELOPMENT PROGRAMME OF PAKISTAN TOBACCO BOARD 2020-21

Development staff of Pakistan Tobacco Board plays a vital role to educate the growers about the latest technology and growing techniques required to improve quality and yield of tobacco crop. Well planned and well managed programmes, workshops and field days are arranged annually to master tobacco grower to produce tobacco crop in order to meet national and international requirement.

Curing is the main phase of tobacco after harvesting and before it could be consumed. With adoption of latest curing technology in the shape of Bulk Curing Barns, our traditional curing also needs improvement. For this purpose approximately 400 number of conventional tobacco barns are modified with the aim to reduce cost of production with improved quality.

The development staff also strives to explore new areas for cultivation of FCV and DAC in all the four Provinces:

1.

PARTICULARS		NO. OF PLOTS TO BE LAID BY PTB KP	
		FCV	WP
1	Model nursery	40	6
2	Model Plots	40	1

The tobacco Companies will lay out model nurseries / plots as detailed below;

2.

S.NO	NAME OF COMPANY	SUPERVISED PRODUCTION PLOTS
		FCV
1	Pakistan Tobacco Company	300
2	Phillip Morris Pakistan (Ltd)	300
3	Soveniour Tobacco Company	5
4	Walton Tobacco Company	5
5	Sarhad Cigarette Industry	5
6	Khyber Tobacco Company	30

The following schedule will be observed for inspection/monitoring and evaluation of plots to be laid out by the Board/Tobacco companies.

i- Laying out of model nurseries from 1st December to end of December.
ii- Submission of lists to the Board from 1st January to 31st January with full particulars.
iii- Laying out of model plots from 1st March to the end of March.
iv- Submission of lists to the Board 1st fortnight of April.
v- Inspection: The senior officers of the Board will inspect the model plots at various stages of crop development.
vi- The ADOs shall inspect the model plots laid out by tobacco companies in the areas of their jurisdiction and shall furnish report to the Board in the relevant columns of the crop monitoring proforma on weekly basis.
vii- The ADOs and Depot Managers of Tobacco Companies shall cooperate with each other in the development activities.
viii- ADOs and Field Assistants submit their tour programme on monthly basis of their respective areas.
ix- Field assistant will submit daily reports on the Board prescribed proformas to Head Office, Assistant Director (Dev) and one copy with himself for the record. (the format of proforma is given below);

S. No	Name of grower:	Address:	Contact No:	Type of tobacco FCV / Rustica:	No. of Barn:	Crop condition:	Recommendations:	Remarks:

1. **TOBACCO WORKSHOPS**

Tobacco workshops will be arranged in various provinces of the country in coordination with tobacco companies to apprise the tobacco growers about the targeted demands of tobacco companies for the crop 2021. The tobacco growers will also be advised for sowing of only recommended tobacco varieties.

2. **FIELD DAYS**

To disseminate the latest technology amongst the tobacco growers of the country, field day will be organized, in various tobacco growing areas. Efforts will be made to arrange these field days at the sites of model nurseries / plot at appropriate stage of nursery and tobacco crop development.

3. **TOBACCO CROP SURVEY**

The field staff of the Board and tobacco companies will carry out the survey of various type of tobacco crop for assessment purpose and furnish reports to the Board.

4. **CROP MONITORING REPORTS**

Crop monitoring reports will be supplied by ADOs to the Board on weekly basis in respect of their area.

5. **SURVEY OF TOBACCO BARNS**

Efforts will be continued to have proper record of tobacco barns operating in different tobacco growing areas.

6. **DISSEMINATION OF TECHNICAL KNOWLEDGE**

To disseminate latest technical knowledge, leaflets / hand bills will be prepared for distribution among the tobacco growers covering all aspects of quality tobacco production. The handouts will be circulated through press.

The field staff of the Board and tobacco companies will continue efforts for popularizing the use of suckericides. The merits of topping/desuckering and harvesting of mature / ripe leaf will also be communicated to tobacco growers.

7. **STREAMLINING OF FERTILIZER AND PESTICIDES**

With the purpose of arranging recommended fertilizers, pesticides for tobacco growers and ensuring their supply in different tobacco growing areas, meeting with concerned companies will be organized. These companies will also be requested to educate growers for use of recommended fertilizer and safe use of pesticides on tobacco crop.

8. **MEETINGS OF ASSISTANT DEVELOPMENT OFFICERS WITH DIRECTOR (R&D) AND ASSISTANT DIRECTOR (DEVELOPMENT)**

To discuss the tobacco crop situation and related problems, meetings of ADOs will be convened during the crop season at appropriate timings.

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