

### Morphological and Biochemical characterization of *Xanthomonas oryzae* pv.*oryzae* isolates collected from Punjab during 2013

Locations	No. of isolates	Shape	Size	Surface	Margin	Color	Opacity	Center	Elevation
Hafizabad	05	Circular	Medium	Even	Even	Yellow	Translucent	Dark	Convex
Gujranwala	06	Circular	Medium	Even	Even	Yellow	Translucent	Dark	Convex
Gujrat	04	Circular	Medium	Even	Even	Yellow	Translucent	Dark	Convex
Sheikhupora	05	Circular	Small	Even	Even	Yellow	Translucent	Dark	Convex
Kala-shah-kaku	03	Circular	Small	Even	Even	Yellow	Translucent	Dark	Convex
Phalia	02	Circular	Medium	Even	Even	Yellow	Translucent	Dark	Convex
Jandiala Sher Khan	01	Circular	Medium	Even	Even	Yellow	Translucent	Dark	Convex
Mern Shah Gogaria	02	Circular	Medium	Even	Even	Yellow	Translucent	Dark	Convex
Pakpatan	02	Circular	Small	Even	Even	Yellow	Translucent	Dark	Convex

Table 1. Colonial morphology of *Xoo* isolates



Isolates No	Locations	Shape	Size	Color	Arrangement	Gram-reaction	VP TEST	CU TEST	MR TEST	IP TEST	Tween- 80 Hydrolysis Test	Arginine Dihydrolase Test
PXo-001	Hafizabad	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-002	Hafizabad	Rods	Medium	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
Pxo-003	Hafizabad	Rods	Small	Purple	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-004	Hafizabad	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-005	Hafizabad	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-006	Gujranwala	Rods	Medium	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-007	Gujranwala	Rods	Medium	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-008	Gujranwala	Rods	Medium	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-009	Gujranwala	Rods	Medium	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-010	Gujranwala	Rods	Medium	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-011	Gujranwala	Rods	Small	Purple	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-012	Gujrat	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-013	Gujrat	Rods	Medium	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-014	Gujrat	Rods	Medium	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-015	Gujrat	Rods	Medium	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-016	Sheikhupora	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-017	Sheikhupora	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-018	Sheikhupora	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-019	Sheikhupora	Rods	Small	Purple	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-020	Sheikhupora	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-021	KalaShah Kaku	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-022	KalaShah Kaku	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-023	KalaShah Kaku	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-024	Phalia	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-025	Phalia	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-026	Jandiala SherKhan	Rods	Medium	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-027	MernShah Gogaria	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-028	Mern Shah Gogaria	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-029	Pakpattan	Rods	Small	Purple	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative
PXo-030	Pakpattan	Rods	Small	Red	Scattered	Negative	Negative	Positive	Negative	Negative	Positive	Negative

VP: Voges-Proskauers, CU: Citrate Utilization, MR: Methyl Red, IP: Indole Production

Table 2. Microscopic Cellular morphology and biochemical characterization of Xoo isolates



Isolates No	Locations	Leaf area affected (%)				Virulence	
		IR-24	Pathogenicity	Super Basmati	Basmati 2000		Mean
PXo-001	Hafizabad	51.2	++	33.6	20.1	26.85	Virulent
PXo-002	Hafizabad	51	++	28	20.8	24.4	Less virulent
Pxo-003	Hafizabad	49.1	+	31.3	24	27.65	Virulent
PXo-004	Hafizabad	54	++	26.2	24.2	25.2	Virulent
PXo-005	Hafizabad	59.6	++	30.6	23	26.8	Virulent
PXo-006	Gujranwala	41.5	+	28.3	35.1	31.7	Virulent
PXo-007	Gujranwala	39.1	+	22.2	33.1	27.65	Virulent
PXo-008	Gujranwala	44.2	+	25	32	28.5	Virulent
PXo-009	Gujranwala	43.5	+	31.2	30.5	30.85	Virulent
PXo-010	Gujranwala	41.8	+	33.3	36	34.65	Virulent
PXo-011	Gujranwala	42	+	24.8	35.9	30.35	Virulent
PXo-012	Gujrat	61	++	47.2	36.5	41.85	Virulent
PXo-013	Gujrat	59.6	++	46.1	38.1	42.1	Virulent
PXo-014	Gujrat	56.7	++	45.2	35.6	40.4	Virulent
PXo-015	Gujrat	55.9	++	47	33.9	40.45	Virulent
PXo-016	Sheikhupora	63.1	++	40.8	59.3	50.05	Highly Virulent
PXo-017	Sheikhupora	62.5	++	39.6	55.8	47.7	Virulent
PXo-018	Sheikhupora	59.8	++	32.6	54.2	43.4	Virulent
PXo-019	Sheikhupora	61.2	++	38.5	56.9	47.7	Virulent
PXo-020	Sheikhupora	64.1	++	43.9	58.8	51.35	Highly Virulent
PXo-021	KalaShah Kaku	44.1	+	36.7	23.5	30.1	Virulent
PXo-022	KalaShah Kaku	38.9	+	36.1	22.1	29.1	Virulent
PXo-023	KalaShah Kaku	41.2	+	33.5	24.8	29.15	Virulent
PXo-024	Phalia	49	+	26.0	36.2	31.1	Virulent
PXo-025	Phalia	43.8	+	25.2	35.1	30.15	Virulent
PXo-026	Jandiala Sher Khan	39.2	+	21.3	29.2	25.25	Virulent
PXo-027	Mern Shah Gogaria	44.1	+	24.8	37.6	31.2	Virulent
PXo-028	Mern Shah Gogaria	42.2	+	25.2	38	31.6	Virulent
PXo-029	Pakpattan	52.3	++	29.8	34.25	32.02	Virulent
PXo-030	Pakpattan	54.7	++	30.1	33.1	31.6	Virulent

+: Pathogenic, ++: Highly pathogenic, Less Virulent: mean < 25%, Virulent: mean ≥ 25%, Highly virulent: mean ≥ 50%

Table 3: Pathogenicity and aggressiveness of Xoo isolates collected during 2013 from Punjab

