

ON THE PHYSIOLOGICAL VARIATION OF *XANTHOMONAS CAMPESTRIS* pv. *BETLICOLA* (PATEL, KULKARNI AND DHANDE) DYE*

Bacterial leaf spot of betelvine caused by *Xanthomonas campestris* pv. *betlicola* is a serious disease of this crop in Kerala and is found to be prevalent in all the betelvine growing areas. In naturally and artificially infected plants different types of symptoms on leaf like angular and non-angular, spots, marginal necrosis and shot-hole are seen in addition to stem infection. It is widely accepted that pathogenic variability is one of the reasons for symptom variation in nature. Artificial inoculation of the different isolates of the bacterium on the cultivar Cheelanthivella resulted in variation in symptom production (Table 1). So the present study was taken up to assess the pathogenic variability among the isolates of the pathogen and its role in the symptom variation. Ten isolates of the pathogen from different areas were used in the study and the test was performed according to the method recommended by the Society of American Bacteriologists (Anon, 1957) and the methods prescribed by Dye (1962).

The results indicated that all the ten isolates of the bacterium behaved alike in all the biochemical and physiological characters studied (Table 2). They utilised glucose oxidatively, hydrolysed starch and arginine, produced hydrogen sulphide and lipases. The bacterial isolates utilised sodium citrate and sodium acetate but not sodium benzoate as the sole source of carbon. All the isolates liquified gelatin, did

Table 1

Variation in symptom on inoculation with isolates of *Xanthomonas campestris* pv. *betlicola* on betelvine cultivar Cheelanthivella

Isolates	Types of symptoms						
	Initial water soaked lesion	Bacterial exudation	Size of lesion	Yellow halo	Shot-hole	Marginal infection	Stern infection
xb- 1	Non-angular	Profuse	Small	Small	Present	Mild	Absent
xb- 2	Non-angular	Slight	Large	Large	Present	Severe	Severe
xb- 3	Angular	Profuse	Small	Small	Absent	Mild	Mild
xb- 4	Angular	Slight	Large	Large	Present	Mild	Severe
xb- 5	Non-angular	Slight	Large	Small	Absent	Mild	Severe
xb- 6	Non-angular	Profuse	Large	Large	Present	Severe	Severe
xb- 7	Angular	Profuse	Small	Small	Absent	Mild	Severe
xb- 3	Angular	Profuse	Large	Small	Absent	Mild	Mild
xb- 9	Non-angular	Slight	Large	Small	Present	Mild	Severe
xb-10	Non-angular	Profuse	Large	Small	Absent	Severe	Severe

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Table 2
Summary of biochemical and physiological characters of the isolates of
Xanthomonas campestris pv. *betlicola*

Sl. No.	Characters studied	Isolates										
		xb-1	xb-2	xb-3	xb-4	xb-5	xb-6	xb-7	xb-8	xb-9	xb-10	
1	Mode of utilization of glucose											
	a) Aerobic		+	+	+	+	+	+	+	4	4	+
	b) Anaerobic	-	-	-	-	-	-	-	-	-	-	-
2	Utilization of organic salts											
	a) Sodium citrate	4	+	+	+	+	+	+	+	+	+	+
	b) Sodium acetate	4	+	+	+	+	+	+	+	+	+	4
	c) Sodium benzoate	-	-	-	-	-	-	-	-	-	-	-
3	Starch hydrolysis	+	+	+	+	+	+	+	+	+	+	+
4	Production of hydrogen sulphide		4	+	+	+	+	+	+	4	4	4
5	MR & VP test	-	-	-	-	-	-	-	-	-	-	-
6	Gelatin liquefaction	+	4	4	+	+	+	+	+	+	+	+
7	Production of indole	-	-	-	-	-	-	-	-	-	-	-
8	Nitrate reduction	-	-	-	-	-	-	-	-	-	-	-
8	Catalase test	4	+	+	+	+	+	+	+	+	+	4
9	Utilization of asparagine as sole source of carbon and N	-	-	-	-	-	-	-	-	-	-	-
10	Lipolytic activity	+	+	+	+	4	4	+	+	+	+	+
11	Tyrosinase activity	-	-	-	-	-	-	-	-	-	-	-
12	Arginine hydrolase test	+	+	+	+	+	+	+	+	+	+	+
13	Growth in 6% NaCl	-	-	-	-	-	-	-	-	-	-	-
14	Action on milk	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL
15	Utilization of carbon compounds with acid production											
	Galactose	+	+	+	+	+	+	+	+	+	+	+
	Mannose	+	+	+	+	+	+	+	+	+	+	4
	Xylose	+	+	4*	4*	+	+	+	+	+	+	+
	Fructose	+	+	+	+	+	+	+	4	+	+	+
	Glucose	+	+	+	+	+	4	4	+	+	+	+
	Maltose	+	+	+	+	+	+	+	+	+	+	+
	Lactose	4	+	+	+	+	+	+	+	+	+	+
	Sucrose	+	+	+	+	+	+	+	+	+	+	+
	Inositol	-	-	-	-	-	-	-	-	-	-	-
	Dulcitol	-	-	-	-	-	-	-	-	-	-	-
	Amygdalin	-	-	-	-	-	-	-	-	-	-	-
	Ribose	-	-	-	-	-	-	-	-	-	-	-
	Salicin	-	-	-	-	-	-	-	-	-	-	-
	Raffinose	-	-	-	-	-	-	-	-	-	-	-

+ Positive reaction — Negative reaction +* Delayed positive reaction AL = Alkaline

not reduce nitrates and failed to produce indole and tyrosinase. Milk was turned alkaline in reaction. None of the isolates utilised asparagine as the sole source of carbon and nitrogen. All of them gave negative MR & VP test. The isolates were found to be catalase positive and growth was inhibited in six per cent sodium chloride. Out of the fifteen carbon compounds tested, all isolates produced acid in galactose mannose, xylose, fructose, glucose, maltose, lactose, sucrose and did not produce acid in inositol, dulcitol, amygdalin, ribose, salicin and raffinose.

Patel *et al.* (1951, 1953), Breed *et al.* (1957) and James Msthew *et al.* (1978a, 1978b, 1979) reported similar results with most of the physiological and biochemical characters of an isolate of the bacterium. In the present study with ten pathogenic isolates of *X. campestris* pv. *betlicola*, there was no detectable variation in the biochemical and physiological properties. The variation in symptom production could not be correlated with physiological and biochemical behaviour of the isolates and it is also felt that no pathogenic variability exists among the bacterial isolates studied.

സംഗ്രഹം

പത്തു സാമ്പിളുകളിൽ നിന്നു വേർതിരിച്ചെടുത്ത സാന്തോമോണാസ് ക്യാമ്പെസ്റ്ററിസ് *pv. ബെറ്റിലിക്കോള* എന്ന ബാക്ടീരിയത്തിന്റെ വ്യത്യാസങ്ങളും, അവയ്ക്ക് വിവിധ തരം രോഗ ലക്ഷണങ്ങളുണ്ടാക്കുന്നതിലുള്ള പങ്കിനെയും കുറിച്ചു പഠനം നടത്തുകയുണ്ടായി ഈ ബാക്ടീരിയകൾ ഫിസിയോളജിയിലും, ജൈവ രാസസ്വഭാവങ്ങളിലും ഒരേ തരത്തിൽ ഉള്ളവ ആണെന്നും, രോഗ ലക്ഷണ വ്യത്യാസങ്ങളിൽ ഇവയ്ക്ക് കാര്യമായ പങ്ക് ഇല്ലെന്നും കണ്ടു.

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