solutions for such kind of boundary-layer flow with zero pressure-gradient. Perhaps they ruled out the possibility of getting similarity equations for a couple stress flow with a nonzero-pressure-gradient. Therefore, in this last section is encountered a nonzero-pressure-gradient that gives rise to a tractable differential equation of the flow along with a set of boundary conditions in line with (9).

With inclusion of pressure gradient $\partial P/\partial x$, P being the pressure, eq. (2) changes to

$$u\frac{\partial u}{\partial x}+v\frac{\partial u}{\partial y}=-\frac{1}{\rho}\frac{\partial P}{\partial x}+\nu\frac{\partial^2 u}{\partial y^2}-\frac{\sigma}{\rho}\frac{\partial^4 u}{\partial y^4}. \quad (15)$$

If the couple stress boundary layer flow is developed with a pressure gradient

$$\frac{\partial P}{\partial x}=\frac{-u_1^3\sigma}{\nu^2}xf'(\eta), \quad (16)$$

then eq. (15) reduces, or, in other words, eq. (6) modifies as

$$f'^2-ff''+Kf'+f'''=Kf^{iv}, \quad (17)$$

which is different from that with nonzero-pressure-gradient. If the flow environment is kept the same, obviously because of change of pressure gradient, the flow velocity will change. The same set of boundary conditions for two different pressure gradients is permissible in so much as the pressure gradient in the present feature has no functional relationship with the boundary conditions.

Retaining the same boundary conditions as eq. (9) and following the same technique and subtlety as earlier, eq. (17) admits of the closed-form solution

$$f(\eta)=(1-e^{-a\eta})/a,\quad f'(\eta)=e^{-a\eta},\quad a=(1+(1/K))^{1/2}, \quad (18)$$

and the velocity components become

$$u=-\frac{K\nu^2\rho}{\sigma}xe^{-a\eta},\quad v=\left(\frac{K\nu\rho}{\sigma}\right)^{1/2}(1-e^{-a\eta})/a. \quad (19)$$

In this case the dimensionless shearing stress on the wall in the same manner as earlier gives

$$\tau=-aK=-(K^2+K)^{1/2}, \quad (20)$$

which satisfies the equation of a rectangular hyperbola.

Boundary-layer flows fostered by similarity transformation and complicated equations in general count upon numerical techniques for their solutions; a vivid study of earlier works[1–3] and their comparison with the present one reveals that the boundary layer flows, both Newtonian and non-Newtonian, are amenable to exact analytical solutions necessitating suitable technique and artifice in envisaging the transformation equation in algebraic trial with the differential equation of flow and prescribed boundary conditions. It has been observed that in the realm of boundary-layer flows of the present kind, different types of solutions are evolved due to different sets of boundary conditions, and sometimes subject to certain restrictions on the values of some fluid parameters. The process of obtaining closed-form solution also depends a lot on the choice of similarity transformation equations. The exact analytical solution herein, unlike that reported[2,3], is not restricted to a certain range of values of any parameter.

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Fungitoxicity of some insecticides

Microorganisms which produce plant diseases have been responsible for considerable crop destruction. It is estimated that plant diseases cause an annual 10% loss in the US crop[1] and 18 to 20% reduction in the world agricultural yields[2]. In recent years, much attention has been paid to plant pathogens[3,4]. While different fungicides are available for controlling plant pathogenic fungi, reports[5] indicate that some insecticides may have additional fungitoxic properties as well. Little information exists on this aspect in respect of the newer insecticides (Durmet, Kanodane, Nuvacron, Nuvan and Cymbush, etc.). The present work was undertaken to determine the effects of these five insecticides under laboratory conditions against selected plant pathogenic fungi.

The efficacy of these insecticides, namely Durmet (20EC), Kanodone (20EC), Nuvacron (36EC), Nuvan (76EC) and Cymbush (25EC) against fungi were tested *in vitro* by the poisoned food technique[6]. The required quantity of test insecticides was weighed and dissolved in sterile water. Requisite concentrations (0.01, 0.05, 0.1 and 0.2%) of these solutions were added to potato-dextrose agar medium in a conical flask and mixed well to get various concentrations. The contents of each conical flask were poured equally into petri dishes. The medium was allowed to set under UV light in laminar flow and 8 mm discs of the fungi were transferred aseptically to the petri dishes. The petri dishes were kept in a BOD incubator at 25°C and incubated for 7 days. The diameter of the fungal colony in each petri dish was measured after 7 days. Control was maintained without fungicides, while a Bavistin was used as a standard fungicide for comparison. Fungicidal activity was expressed as per cent inhibition by standard formula[7].

From Table 1, it is evident that Durmet, Cymbush, Nuvacron and Nuvan were highly active in inhibiting the mycelial growth of *Fusarium oxysporum*, *Helminthosporium* sps., *Sclerotium*

Table 1. Fungitoxicity of some insecticides (% mycelial inhibition)

Plant pathogenic fungi	Concentration (%)																			
	Control	Durmet				Kanodane				Cymbush				Nuvacron				Nuvan			
		0.01	0.05	0.1	0.2	0.01	0.05	0.1	0.2	0.01	0.05	0.1	0.2	0.01	0.05	0.1	0.2	0.01	0.05	0.1	0.2
F. oxysporum	0	43.3	52.62	66.66	81.11	35.55	37.85	44.44	70	22.22	36.66	58.88	80	14.44	38.88	100	100	20	39.24	56.25	100
A. solani	0	66.66	88.88	84.44	100	26.66	50	60.89	75.55	20	64.44	73.33	87.77	0	43.33	60	100	6.66	43.33	65.33	100
C. lunata	0	60	77.77	83.3	90	37.77	53.33	70.55	80.55	27.77	57.32	78.8	90.5	11.11	44.44	91.48	100	11.11	66.66	75.18	100
Helmintho-sporium sp.	0	68.75	83.33	90	100	45	55.55	80.62	88.88	32.5	58.88	83.75	100	18.75	36.61	88.12	100	32.5	55.55	100	100
S. rolfsii	0	70	89.44	100	100	55.55	77.77	90	100	13.33	55.55	81.38	100	0	48.33	100	100	37.77	79.88	100	100

rolfsii, *Curvalaria lunata* and *Alternaria solani*. 90% inhibition was observed at 0.2% with respect to all fungi against different insecticides. As the dose was decreased, there was decrease in inhibition. Except Durmet and Kanodone, the rest of the insecticides did not exhibit any significant inhibition at 0.01%. Durmet was active even at 0.01% on all different fungi.

The fungitoxic properties of pesticides whose primary defined targets are the insects may perhaps be due to their cuticular penetration abilities, which may extend to fungal mycelia. Precise mode of fungitoxic action of such chemicals needs to be elaborated by detailed studies. However, the additional property can perhaps be used to advantage in well-designed pest control strategies in various crops beset with both insect and fungal pests.

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On incorrect use of Student's *t* test in bio-medical research

Student's unpaired *t* test is used to test whether the means of the two groups are statistically different or not. Student's unpaired *t* test is written as *t* test for simplicity in this article. Various types and aspects of *t* test like situations where the test is applicable, assumptions made, calculation procedure, advantages and limitations have been described in standard statistical books[1,2].

While perusing bio-medical articles, the author has come across various types of errors in the application and interpretation of *t* tests. The situations where *t* test is not 'valid' or if it is 'valid' it is with reduced power are defined as errors in this article. The purpose of this article is to illustrate these errors and to indicate correct statistical procedure to be adopted and alternative statistical tests to be used. It is hoped that this would enable research scientists having inadequate statistical knowledge to apply appropriate test correctly and to identify situations where expert statistician's help is essential.

Most of the examples presented in this article are taken from published bio-medical articles with application of *t* tests. No attempt has been made to obtain the raw (basic) data from the authors. The statistical values for appropriate procedures and alternatives are calculated whenever possible, otherwise only references are mentioned.

Definitions used in this study for comparison of two means: Null Hypothesis (NH): A statement concerning the values of a population parameter. Here the means of the two groups are equal.

α (alpha): The significance level of a test: The probability of rejecting the null hypothesis when it is true (or the probability of making a Type I error).

β (beta): The probability of correctly rejecting the null hypothesis when it is true (or the probability of making a Type II error).

Confidence level ($1-\alpha$): The probability that an estimate of a population is within certain specified limits of the true level.

Power of a test ($1-\beta$): The probability of correctly rejecting the null hypothesis when it is false.

Confidence interval of the difference: The probability that an estimate of a difference in two populations is within certain specified limits.

One-tailed (sided) test: In hypothesis testing, when the difference being tested is directionally specified beforehand,