

Quantification of Credit for Authorship

V L KALYANE AND K VIDYASAGAR RAO

The three known credit systems, namely—Normal Count (NC), Fractional Count (FC) and Straight Count (SC) were compared with the newly proposed—Positionwise Count (PC). The merit of this method is that, it takes into account the author's placement (position) among the contributors and allots proper weightage. PC is however more realistic and appropriate as long as the author's contribution is linear to the position in authorship.

0 INTRODUCTION

Science and technology has emerged as a profession. Debates and discussions on accountability¹ of this new profession are current topics of concern. Causal model of research productivity² among natural scientists has shown that, education and year of service has an important positive impact, but psychological factors have negligible effect, and the influence, the scientist has on his research endeavors, has a modest positive impact of productivity.

There are only few comparable bibliometric data, concerning various research teams³. In some fields of science there is a strong convention, different from field to field, about the order of the names in the by-line of a paper. In theoretical physics it is invariably alphabetic and in some biosciences it is in the order of seniority of the author or in the magnitude of his personal contribution to the collaboration⁴. Comparison and assessment of scientific impact of research teams is very difficult, but it appears to be an urgent need for science policy makers and for researchers themselves⁵. An Agricultural Research Institution is the centre of production of scientific knowledge forming important component of knowledge generating system⁶ that deals with intellectual resources in the domain of agriculture.

Bibliometric database was created for sugarcane improvement publications from Sugarcane Breeding Institute (SBI) Coimbatore for 75 years since its inception in 1912. SBI is the premier institute with one of the mandate being sugarcane improvement⁷. Productivity analysis in general was published⁸. Present study attempts to highlight credits for the grand success by identifying core authors in the publica-

tions based on various credit systems in vogue and comparing with proposed new method.

1 METHODOLOGY

Three accounting procedures to quantify credit for author's to a research paper publication were described namely: Normal Count (NC), Fractional Count (FC) and Straight Count (SC). These methods are described as:

- 1 Normal Count (NC): One full score credit is given for each author regardless of their position.
- 2 Fractional Count (FC): Each author gets credit in equal proportion ($1/N$: where N = number of authors).
- 3 Straight Count (SC) : Only first author gets credit and allots the score as one.

Each method has its own merits and demerits⁹. In this paper we have proposed a new method namely Positionwise Count (PC) in which each author gets weightage as per the position occupied in the sequence of authorship.

The weightage for the author can be obtained from the formula

$$W_i = A_i / \sum_{i=1}^N A_i \dots\dots(1)$$

$$\text{where } A_i = \frac{(N+1-i)}{N}$$

and N is the number of authors

For example, the weightages (W_i) for the authors position with varying authors (N) is shown in the following table:

Author Position	Weightage (W_i)		
	$N = 3$	$N = 4$	$N = 5$
First (1)	0.50	0.40	0.33
Second (2)	0.33	0.30	0.27
Third (3)	0.17	0.20	0.20
Fourth (4)	-	0.10	0.13
Fifth (5)	-	-	0.07

In the present study only multi-authorship papers were considered as single authorship papers have no relevance for application of comparisons.

2 RESULTS AND DISCUSSION

The mean scores and coefficient of variation (CV%) of different disciplines in different methods are shown in table 1. The results indicate that the scores under normal count are more stable, closely followed by positionwise count. From reality the Normal Count looks inappropriate as it provides one score to each author and therefore, it overestimate the mean score compared to other methods. On the otherhand, Positionwise Count provides the balanced score as it lies in between the other three methods. Straight count looks unreliable as it has high CV (%) in all the disciplines.

The association among the methods for each discipline is shown in table 2. These results indicate that Positionwise Count has high correlation with other three methods in all the disciplines and suggest that PC can as well be selected as an alternate considering the merit in its methodology. Further the analysis of variance (Table 3) reveals significant difference among the methods for all the disciplines. This confirms our expectation as each method has its own procedure. For example, the scores obtained in Straight Count (SC), only first author was counted and gets the score as one in all the papers. In Fraction Count (FC), the scores obtained with equal weightage among the contributors and therefore lower down the average score. On the otherhand the scores obtained through Normal Count (NC), always over estimates as each contributor gets one score irrespective of their quantum of contribution. Hence a new method known as Positionwise Count (PC) is proposed in this paper after due rectification of these drawbacks. In this method the authors get weightage in the paper as per their position appeared in the authorship. For

example, in three authorships paper, from formula (1), the first author will be assigned the weight as 0.50 and second author with 0.33 and the third author with 0.17. This type of weightage, is more realistic as long as the author's position is linearly related to the amount of contribution in the paper.

This method could correctly project the scientific contribution of an institution, to administrators and policy makers to create their interest in providing national as well international funds for further progress and for harnessing the potentials of core researchers to collaborate at inter-institutional, national and international levels.

It is, therefore, recognized that proper quantification of credit for authorship through institutional bibliometric databases on publications, and other agreed upon productivity indicators involved in assessment of accountability and reward system would go a long way in creating confidence among both planners and administrators besides further motivating researchers for higher levels of accomplishments by competing with ones own past records.

3 CONCLUSION

It is well known in the literature that several methods are adopted to measure research productivity of individual research group research institute, etc. In the present paper we studied three widely followed methods and considering the drawbacks, a new method known as Positionwise Count

TABLE 1
MEAN AND COEFFICIENT OF VARIATION (C / %) OF DIFFERENT DISCIPLINES IN DIFFERENT METHODS

Methods/ Discipline	Mean & CV (%) ^a				
	Breeding [3]	Botany [39]	Genetics & Cytology [27]	Genetic Resources [23]	Mutation [27]
Normal Count (NC)	2.06(62)	1.76(51)	1.92(52)	1.72(39)	1.29(36)
Fraction Count (FC)	1.36(70)	1.25(60)	1.39(65)	1.02(46)	0.84(40)
Straight Count (SC)	1.14(107)	1.10(88)	1.19(101)	0.78(116)	0.51(147)
Positionwise Count (PC)	1.73(65)	1.51(58)	1.67(59)	1.37(48)	1.04(48)

^a Based on square-root transformations.
Figure in square brackets indicate sample size.
Figure in parenthesis are CV (%).

TABLE 2
CORRELATIONS AMONG DIFFERENT METHODS IN DIFFERENT DISCIPLINES

Co-relation	Breeding	Botany	Genetics	Genetic & Cyto.	Mutation Resources
NC vs FC	0.97	0.98	0.95	0.95	0.95
vs SC	0.81	0.84	0.87	0.74	0.64
vs PC	0.98	0.97	0.98	0.95	0.93
FC vs SC	0.85	0.86	0.85	0.77	0.74
vs PC	0.97	0.97	0.94	0.94	0.96
PC vs SC	0.90	0.92	0.94	0.88	0.86

TABLE 3
ANALYSIS OF VARIANCE OF DIFFERENT DISCIPLINES

Discipline	df	F-ratio*
Breeding	(3/200) ^a	6.224**
Botany	(3/112)	3.186*
Genetics & Cytogenetics	(3/184)	4.448**
Genetic resources	(3/80)	7.645**
Mutation	(3/80)	7.796**

^a df of numerator and denominator in F-ratio

between methods to within methods

*,** Significant at 5% and 1%, respectively.

has been proposed. In this method the position of the author among the contributors is taken while allotting the weightage. This type of allotting weightage is more realistic as long the assumption, that the position is linearly related to the quantum of contribution is satisfied.

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THE AUTHORS

Mr VL KALYANE is Scientific Officer (SD), Library and Information Service Division, Bhabha Atomic Research Centre, Trombay, Bombay 400 085; and Dr K VIDYASAGAR RAO is Senior Statistician at International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Hyderabad 502 324.

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