Loganathan Karthik *Editor*

Actinobacteria

Microbiology to Synthetic Biology

Loganathan Karthik
Editor

Actinobacteria

Microbiology to Synthetic Biology

Springer

Editor
Loganathan Karthik
Synthetic Biology, R&D Center
Salem Microbes Private Limited
Salem, India

ISBN 978-981-16-5834-1 ISBN 978-981-16-5835-8 (eBook)
https://doi.org/10.1007/978-981-16-5835-8

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Contents

Chapter 13
Antimicrobial Potential and Metabolite Profiling of Marine Actinobacteria

Jignasha Thumar and Satya P. Singh

Abstract Over 90% volume of the Earth's crust is covered by oceans. Many natural product-based drug discovery programs are being run and funded by developed countries. Marine organisms harbor incredibly diverse natural products with novel pharmaceutical applications. Among all the marine microorganisms, actinomycetes remain the most popular because of their capacity to produce a wide range of secondary metabolites that can be developed into drugs for treatment of wide range of diseases in human, agriculture, and veterinary sectors. Further, these compounds also hold the potential in treatment of life-threatened infections in humans. Numerous antibacterial, antifungal, cytotoxic, neurotoxic, antiviral, and antitumor compounds against new targets including AIDS, anti-inflammation, aging process, and immunosuppression have been characterized from marine actinomycetes. *Streptomyces* is the most prominent genus studied so far in this regard. However, many rare actinomycete genera have also been reported to produce a diverse array of antimicrobial compounds including polyenes, peptides, macrolides, aminoglycosides, polyether, etc. This chapter highlights the metabolite profiling of marine actinomycetes with respect to current status on drug discovery programs. It further stresses on the emergence of discovery of new antimicrobial metabolites, as the replacement of already existing ones, due to serious problem of antibiotic resistance among the human pathogens.

Keywords Marine actinomycetes · Metabolite profiling · Antibiotic resistance · Antimicrobial metabolites · Drug discovery

J. Thumar (✉)
Department of Microbiology, Government Science College, Gandhinagar, Gujarat, India

S. P. Singh
Department of Biosciences, Saurashtra University, Rajkot, Gujarat, India

L. Karthik (ed.), *Actinobacteria*, https://doi.org/10.1007/978-981-16-5835-8_13

Zhang D, Shu CY, Lian XY, Zhang ZZ (2018b) New antibacterial bagremycins F and G from the marine-derived *Streptomyces sp.* ZZ745. Mar Drugs 16:330. https://doi.org/10.3390/md16090330

Zhang SW, Gui C, Shao MW, Kumar PS, Huang HB, Ju JH (2018c) Antimicrobial tunicamycin derivatives from the deep sea-derived *Streptomyces xinghaiensis* SCSIO S15077. Nat Prod Res 34(11):1499–1504. https://doi.org/10.1080/14786419.2018.1493736

Zhang D, Yi W, Ge H, Zhang Z, Wu B (2019a) Bioactive streptoglutarimides A-J from the marine-derived *Streptomyces* sp. ZZ741. J Nat Prod 82(10):2800–2808. https://doi.org/10.1021/acs.jnatprod.9b00481

Zhang S, Xie Q, Sun C, Tian XP, Gui C, Win XJ, Zhang H, Ju JH (2019b) Cytotoxic kendomycins containing the carbacylic ansa scafold from the marine-derived *Verrucosispora* sp. SCSIO 07399. J Nat Prod 82:3366–3371. https://doi.org/10.1021/acs.jnatprod.9b00654

Common wild edible foods in weekly tribal markets

Chapter · March 2022

DOI: 10.5281/zenodo.6395706

6 authors, including:

B.L. Manjula
Sri Jagadguru Renukacharya College Of Science, Arts and Commerce
44 PUBLICATIONS **58** CITATIONS
SEE PROFILE

Asim Panda
Raidighi College
10 PUBLICATIONS **4** CITATIONS
SEE PROFILE

Sugimani Marndi
68 PUBLICATIONS **64** CITATIONS
SEE PROFILE

Sanjeet Kumar
Ambika Prasad Research Foundation
578 PUBLICATIONS **1,684** CITATIONS
SEE PROFILE

Common wild edible foods in weekly tribal markets

BL Manjula[1], Asim Panda[2], Rita Shivlal Chudasama[3], Sanath Kumar N[4], Sugimani Marndi[5] and Sanjeet Kumar[5*]

[1]Department of Botany, Sri Jagadguru Renukacharya College of Science, Arts and Commerce, Bengaluru, Karnataka, India
[2]Department of Botany, Raidighi College, West Bengal, India
[3]Department of Botany, Government Science College, Gandhinagar, Gujarat, India
[4]School of Applied Sciences, Centurion University of Technology and Management, Odisha, India
[5]Ambika Prasad Research Foundation, Odisha, India
Email-Id: sanjeetaprf@gmail.com
DOI: 10.5281/zenodo.6395706

ABSTRACT

The urban population is facing shortage of food items and organic food materials. Therefore, researchers, entrepreneurs and food lovers are searching food from wild food plants. The tribal markets are the perfect platforms for screening wild food plants for future urban foods. Therefore, an attempt has been made to the survey of tribal markets of Bonai Forest Division, Odisha for enumerating commonly used wild foods. The survey results revealed that about 10 wild edible food species are commonly sold in most of tribal markets of study areas. They could be the future foods for the urban population.

Keywords: Wild, food value, medicinal value, economic value, tribal area, weekly market

INTRODUCTION

Food is the most essential requirement for sustenance of human life. Population of human beings are increasing very fast. Populace of the world is consuming limited number of agricultural crops and wild foods. Wild foods are usually consumed by the indigenous people throughout the world and they are mainly unexplored by the scientific community. The burning issue globally is to provide adequate amount of food for increasing population. In many countries, the malnutrition, food security and problems related to food are observed and organizations of national and international repute are working on them. To mitigate the problems, researchers are searching the wild food plants used by the ethnic community. Tribal markets are easy source(s) to get the tribal food or wild food plants. They collect from the near forested areas and consume them and as well as sell them to get very little amount of money for their livelihood. Therefore, keeping the importance of tribal haat (Weekly Tribal Market), an attempt has been made to enumerate the wild foods available in different tribal markets of Bonai Forest Division (BFD), Odisha. BFD is home of Bhuian, Munda, Oram, Kisan, Santhal etc. (Kumar et al., 2021; Kumar and Kumar 2021; Kumar et al., 2022). They have empirical knowledge about wild plants which can be used as food. The present paper highlights the importance of wild food plants to mitigate the food problems globally.

METHODOLOGY

The survey work was done in the year 2021-2022. Through a series of questionnaire, authors have collected the data from local weekly markets of Bonai Forest Division, Odisha, India (Plate 2). The local names were noted down and the plant species were identified by Dr. Sanjeet Kumar, Ambika Prasad Research Foundation, Odisha, India with the available books on Flora (Haines 1925; Saxena and Brahman 1995).

RESULTS AND DISCUSSION

Results revealed that 10 common wild edible foods like fruits of *Morus alba,* flowers of *Indigofera cassoides,* leaves of *Centella asiatica, Polygonum plebeium* & *Chenopodium album,* fruits of *Antidesma bunius,* tuber of *Dioscorea bulbifera* etc. Raanu pills etc are used as food. Raanu pills are natural fermenting agents made by the rice powder and roots of locally available medicinal plants. Plant

Plate 1: Wild edible foods in the tribal markets of Bonai Forest Division, Odisha, a) Fruits of *Morus alba,* b) Flowers of *Indigofera cassoides,* c) Leaves of *Polygonum plebeium,* d) Leaves powder of *Antidesma bunius,* e) Leaves of *Centella asiatica,* f) Leaves of *Chenopodium album*

parts like edible fruits, flowers and leaves are recorded. Details are listed in the Table 1. It was observed that season wise the weekly market products are changed but most common wild foods are the listed 10 species in Table 1 and Plate 1. It was noted that leaves are used more than other plant parts. Some other researchers have also documented the wild foods globally. Sinha and Lakra (2005) have reported 26 wild leafy vegetables, 30 types of wild fruits, 12 types of flowers, 11 types of seeds and 14 types of wild tuberous plants from Orissa. Kumar et al. (2012) reported 79 wild edible food plants including 11 species of *Dioscorea* from Similipal Biosphere Reserve Forest, Odisha, India. Singh and Kumar (2016) have reported 32 less known wild herbaceous plants consumed by the Munda tribe of district Khunti, Jhaarkhand, India. They have reported wild edible plants like *Butomopsis latifolia*, *Hygrophila auriculata*, *Limnophila aromatica*, *Limnophila repens*, *Limnophila rugosa*, *Marsilea minuta*, *Monochoria vaginalis*, *Rungia quinqueangularis* and *Sagittaria sagittifolia* etc. Bhatia et al. (2018) have reported 90 wild edible food plants from Jammu & Kashmir, India. Samal et al. (2019) have reported 160 species of wild edible plants from Keonjhar, Odisha, India. Kumar (2019) reported 103 species of wild edible plants from Bilaspur district, Himachal Pradesh, India. Saravanan et al. (2020) documented 85 wild food plants from Kuldiha Wildlife Sanctuary, Odisha, India. They also documented that *Leucas ciliata, Monochoria vaginalis, Alternanthera sessilis and Flemingia macrophylla* are consumed for medicinal purposes.

Plate 2: Survey works and tribal women are selling different wild edible foods in the tribal markets of Bonai Forest Division, Odisha, India

Table1: Wild edible foods available in the tribal markets of Bonai Forest Division, Odisha, India

Botanical Name	Local Name	Parts Used	Significance
Morus alba	Tut kuli	Fruit	Food value, Economic value, Medicinal value
Indigofera cassoides	Girli	Flower	Food value, Economic value, Medicinal value
Centella asiatica	Beng saag	Leaves	Food value, Economic value, Medicinal value
Chenopodium album	Bathua saag	Leaves	Food value, Economic value, Medicinal value
Antidesma bunius	Matha saag	Leaves	Food value, Economic value, Medicinal value
Polygonum plebeium	Pimpedi saag	Leaves	Food value, Economic value, Medicinal value
Dioscorea hispida	Korba aalu	Tuber	Food value, Economic value, Medicinal value
Dioscorea bulbifera	Pitalu	Tuber	Food value, Economic value, Medicinal value
Raanu pills	Raanu	Rice powder & roots of some locally available medicinal plants	Food value, Economic value, Medicinal value
Ficus spp.	Putkal saag	Leaves	Food value, Economic value, Medicinal value

CONCLUSION

Present study concluded that the tribal markets are the good source for collecting information about the wild edible food plants and their associated traditional practices for advanced scientific works in food chemistry, food biology and food problems. The most common 10 enumerated wild food plants revealed that they could be the future foods for urban food baskets.

ACKNOWLEDGEMENT

Authors are thankful to the Forest officials of Bonai Forest Division and local tribal communities of study areas and weekly markets.

REFERENCES

Bhatia H, Sharma YP, Manhas RK and Kumar K. (2018). Traditionally used wild edible plants of district Udhampur, J&K, India. Journal of Ethnobotany and Ethnomedicine. 14: 73.

Haines HH. (1994). The Botany of Bihar and Orissa. Adlard& Sons, London.

Kumar S, Jena PK and Tripathy PK. (2012). Study of wild edible plants among tribal groups of Similipal Biosphere Reserve Forest, Odisha, India; with special reference to *Dioscorea* species. International Journal of Biological Technology. 3(1): 11-19.

Kumar S. (2019). Wild edible plants consumed by rural communities in district Bilaspur, Himachal Pradesh, India. Journal of Biological and Chemical Chronicles. 5(2): 1-11.

Kumar SN and Kumar S. (2021). Taxonomic note on Luisia zeylanica (Orchidaceae) from Bonai Forest Division, Odisha, India. Richardiana. 5: 142-147.

Kumar SN, Mishra S and Kumar S. (2021). Documentation of Indigenous Traditional Knowledge (ITK) on commonly available plants in Koira range, Bonai Forest Division, Sndargarh, Odisha, India. Asian Plant Research Journal. 8(4): 83-95.

Kumar SN, Mishra S, Marndi S, Kondaji P, Choudhary R and Kumar S. (2022). Tadi: a country liquor of Bonai Forest Division, Odisha, India. Journal of Biodiversity and Conservation. 6(1): 461-463.

Samal D, Rout NC and Biswal AK. (2019). Contribution of wild edible plants to the food security, dietary diversity and livelihood of tribal people of Keonjhar district, Odisha. Plant Science Research. 41(1&2): 20-33.

Saravanan R, Kannan D, Panda SP and Datta S. (2020). Traditionally used wild edible plants of Kuldiha wildlife sanctuary (KWLS), Odisha, India. Journal of Pharmacognosy and Phytochemistry. SP6: 482-488.

Saxena HO and Brahmam M. (1995). The flora of Orissa. Orissa Forest Development Corporation & RRL, Bhubaneswar.

Singh G and Kumar J. (2016). Diversity and traditional knowledge on some less known edible wild herbaceous plant resources from district Khunti, Jharkhand, India. International Journal of Bioassays. 5(5): 4557-4562.

Sinha R and Lakra V. (2005). Wild tribal food plants of Orissa. Indian Journal of Traditional Knowledge. 4(3): 246-252.

BAOU
Education for All

NAAC ACCREDITED A++ GRADE 3.55/4

Proceeding

National Seminar

Role of Libraries in Transforming Societies

Organized by

Dr. Babasaheb Ambedkar Open University
***'Jyotirmay'* Parisar, Dr. Babasaheb Ambedkar Open University Marg, Ahmedabad**
www.baou.edu.in

Library is the heart of an Educational Institute. It is a matter of immense pleasure that BAOU has organized a National Seminar on "*Role of libraries in transforming Societies*" dated on 28/03/2022.

This incentive venture is indeed excellent in accordance to Academicians, Librarians, Students, Research Scholars and Policy makers. It is a wonderful opportunity to enhance their understandings regarding the contemporary scenarios of libraries.

The conference proceeding is being proclaimed on this juncture. The source of information to the library profession is preferential at this instance. Quick advancement of information and communication technologies has changed the conventional concept of libraries.

Dr. Babasaheb Ambedkar Open University is the ingenuous forum for lifelong learning opportunities and skill development for all learners exclusively with innovative technologies and methodologies.

The object of this conference is to establish a concrete platform to instigate scholars researchers, professionals to accomplish their research target in full.

Prof.(Dr.) Ami Upadhyay
Vice-Chancellor
Dr. Babasaheb Ambedkar Open University,
Ahmedabad.

રાષ્ટ્રીય પરિસંવાદ

“Role of Libraries in Transforming Societies”

:: સંપાદક ::

પ્રો.(ડૉ.) અમી ઉપાધ્યાય : માનનીય કુલપતિશ્રી
ડૉ. મહેશપ્રસાદ ત્રિવેદી
ડૉ. પ્રિયાંકી વ્યાસ
ડૉ. ચેતના શાહ
શ્રી. નિશા સુનિલ જોષી

:: સહ સંપાદક (નિર્માણ સહાય) ::

પ્રો.(ડૉ.) નિલેશ મોદી
ડૉ. આવા શુક્લા
પ્રો.(ડૉ.) યોગેન્દ્ર પારેખ
પ્રો.(ડૉ.) અજીતસિંહ રાણા
પ્રો.(ડૉ.) મનોજ શાહ

:: પ્રકાશક ::

ડૉ. ભાવિન ત્રિવેદી, કાર્યકારી કુલસચિવ

ISBN : 978-93-5598-308-4

Year: 2022

ડૉ. બાબાસાહેબ આંબેડકર ઓપન યુનિવર્સિટી
(ગુજરાત સરકાર દ્વારા સ્થાપિત)
“જ્યોતિર્મય” પરિસર
સરખેજ-ગાંધીનગર હાઈવે, છારોડી, અમદાવાદ – 382 481.
E-mail : info@baou.edu.in Website : www.baou.edu.in

Index

Role of Library in Government Colleges of Gujarat During Covid-19 Pandemic

Jayshree D. Pandya, Research Scholar, Gujarat University, Gandhinagar

Abstract

The purpose of this study is to investigate the various innovative support strategies rendered by academic libraries in support of e-learning in government colleges of Gujarat. This was necessitated by the change in nature of learning and services provision in colleges because of COVID-19. A quantitative study was done to the role of digital library services in supporting e-learning in government colleges of Gujarat. An online questionnaire was developed and distributed among librarians in Government colleges of Gujarat. Based on the response received, it was found that academic libraries play an important role in supporting e-learning in higher education institutions by providing electronic information resources, which are key in research, learning and teaching. The libraries provide a one-stop shop for accessing electronic resources through the remote login facility. Patrons have benefitted by accessing and using digital library services during the COVID-19 lockdown period. It was also discovered that libraries should ensure that they are prepared to always offer their services despite the closure of physical buildings because of the pandemic.

Keyword: Digital libraries, Academic libraries, College libraries, Covid-19, pandemic, e-learning

Introduction:

The outbreak of the COVID-19 pandemic resulted in significant changes in how the world operate. University closures were not anticipated, and higher education institutions were not spared. Despite the confinement, learning was meant to continue despite the pandemic's arrival. During the lockdown, libraries were required to continue providing services even though physical premises were shuttered. Even though digital and virtual libraries have been established, their use has been a source of concern among academics.

Covid-19 has significant impact on students in higher education in all over the World and in the current study we research about how effect Covid-19 in government colleges of Gujarat, due to Covid-19 arrival and imposing lockdown all higher education institute are closed to avoid face to face learning and maintained social distancing. The Department of Higher Education of Gujarat government decided to implement a common platform MS TEAM (Microsoft Team) for providing online education in all colleges for the benefit of student unable on uninterrupted learning during Covid-19. They gave training of MS Team to all colleges staff and provided

ISBN : 978-93-5598-308-4

username and password to all staff. Colleges created ID and password of students to connect them in online learnings. During this time main challenges for both faculty and student are availability of resources in online mode. Librarians have an important role in such a situation to provide information sources and services to the students as well as faculty.

Literature Review

Guo et al.(2020) identify the measures employed in the provision of patron services in Chinese academic libraries responding to the COVID-19 pandemic, also stated that over majorly Chinese academic librarian provide remote access facility for electronic resources, research support service delivered online, the use of social media such as WeChat and micro-blog and the continuous development of new media provided convenience and opportunities for library patron services. It is found in this survey that the WeChat official accounts are updated much faster than the library websites, indicating that the libraries gave full play to the role of social media platforms in disseminating information and inspiring morale

Tsekea et al (2020). Highlighted academic librarians are using pioneering services to provide digital library services during the lockdown period, according to the report. Despite the shutdown of physical premises, the academic library has been relocated to the Center for Learning and Research to continue to provide virtual services. Patrons have been using social media tools and programmes to access electronic resources and other services, and new ways of providing these services have emerged. It was also discovered that libraries should ensure that they are always prepared to provide services, even if physical premises are closed due to the epidemic.

McTAVISH et al. (2020) find Academic librarians work in a variety of library ecologies, according to the data, and most of them gain considerable technological and pedagogical skills while doing so. The outcomes of this study have obvious consequences for the curriculum of academic librarian preparation programmes. Librarians, as well as their duties as creators of learning materials and online guides that students can use at any time. Some librarians hold leadership positions in their schools' eLearning and educational technology departments, and they are responsible for driving institutional programmes both in libraries and throughout campus.

Craft (2020) stated that many libraries have made the switch to remote work because of the COVID-19 pandemic is unprecedented. This column examines the history, planning, case studies, technology and equity concerns, challenges, and potential benefits of remote work in library technical services, as well as the history, planning, case studies, technology and equity concerns, challenges, and potential benefits of remote work. Initial linkages are made between current literature and the pandemic's influence on remote work, and further study and debate directions are suggested.

ISBN : 978-93-5598-308-4

Objective

The present research study was undertaken to determine how government college librarians would describe their present roles in online learning environment. Following are the major objectives of the study:

- To know how online classes conducted by Gujarat government colleges
- To know the applications used by Gujarat government colleges to conduct online classes
- To know the role of librarian in Covid-19.
- To know the library services provided by government college librarian during Covid-19.

Methodology

The study is basically a 'case study' based on descriptive survey research methodology for collecting data. Online questionnaire for collecting quantitative data was used. Major component of being assessment of government college libraries that are providing services to e-learners during covid-19, for that questionnaire sent to 50 college librarians working in Government or Government-aided colleges to find out the role of library professionals in e-learning environment during covid-19 through google form. After collecting the data from the survey, the responses were analyzed/interpreted using MS-Excel program. A total of 35(70%) librarians responded to the questionnaire and the data was analyzed and presented thematically.

Data Analysis and Finding

The findings revealed that libraries play a significant role in supporting e-learning at a university by enhancing scholarly communication, allowing learners to use information resources from anywhere.

The survey of 35 libraries found online classes provided by colleges 100% means all respondent colleges run online class and all colleges use the MS TEAM platform and 14.29% used google meet and 22.86% used Zoom along with MS TEAM.

Table -1 College Providing Online Classes During Covid-19 Pandemic

Answer	Respondent	Percentage
Yes	35	100.00
No	0	0.00
Total	35	100.00

As per Figure 1 showed 48.57% library provided service of remote login facility so that students can access e-journals and e-books from home, even 37.14% college library given information literacy program through MS TEAM, 28.57% college provide online database and library website services, 31.43% library provide FAQs(Frequently Asked Questions) services to their

ISBN : 978-93-5598-308-4

users, 5.71% using their library mobile app to provide library services and 2.86% provide online issue-return facility to the students.

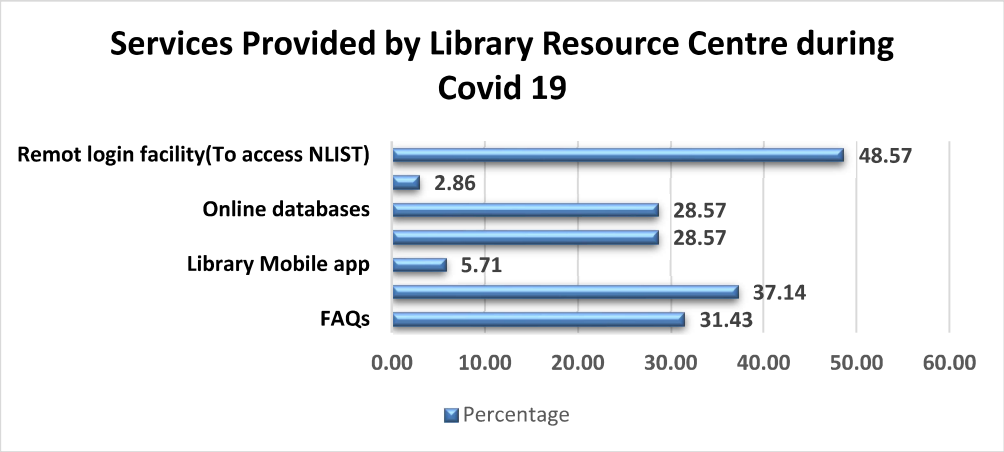

Figure 1: Service Provided by library Resource Centre during Covid-19.

Now a days through Information literacy program students can know the library resources and services, library profession was asked to whether they given information literacy program during Covid-19 and data shown in figure 2.

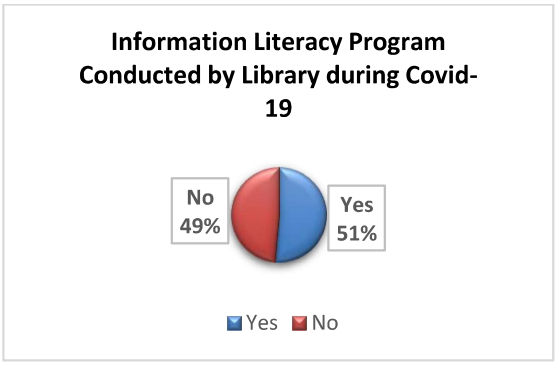

Figure 2: Information Literacy Program Conducted by Library during Covid-19

Remote login facility provided by library question was asked to librarian and found that 68.75% provided remote login facility and 31.43% didn't provide this facility to the users.

Table -2 Remote login facility Provided by Library

ISBN : 978-93-5598-308-4

Answer	Respondent	Percentage
Yes	24	68.57
No	11	31.43
Total	35	100.00

Librarians were asked to mention the percentage of user's access to online subscribed resources through remote login facility. 16 (66.67%) of respondents mentioned that 0 – 25% of user's access of online resources followed by 20.83% of respondents mentioned 26 – 50% user's access online resources, very low 8.33% of respondents mentioned that 76 – 100% user's access to online subscribed resources through remote login facility as per Table-3.

Table-3 Percentage of User's Access to Online Subscribed Resources through Remote Login Facility

Percentage of user	Respondent	Percentage
0 - 25	16	66.67
26 - 50	5	20.83
51 - 75	1	4.17
76 - 100	2	8.33
Total	24	100.00

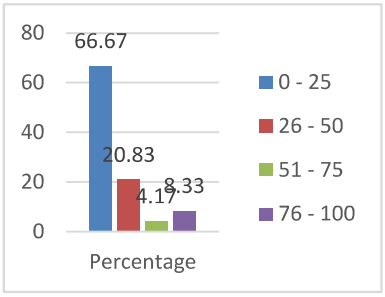

Figure 3 Percentage of User's Access to Online Subscribed Resources through Remote Login Facility

A question was asked to librarian that whether online resources access is increased during Covid-19 and their response given in Table-4

Table-4 Usage of Online Resources Increased through Remote Login Facility During Covid-19

Answer	Respondent	Percentage
Yes	20	83.33
No	4	16.67
Total	24	100.00

Library Provide any Online Training or Awareness Program for Online Database During Covid-19 question were asked to librarian and 65.71% colleges given online database access awareness program for students in online mode and 34.29% not given any awareness program to their students.

ISBN : 978-93-5598-308-4

Question was asked to professional that is there any Involvement of Library Professionals Direct/ Indirect in e-learning? And 100% librarian respondent that they are involved in direct and indirect in online learning. Figure 4 given below shows different area in which librarians are directly involved in e-learning.

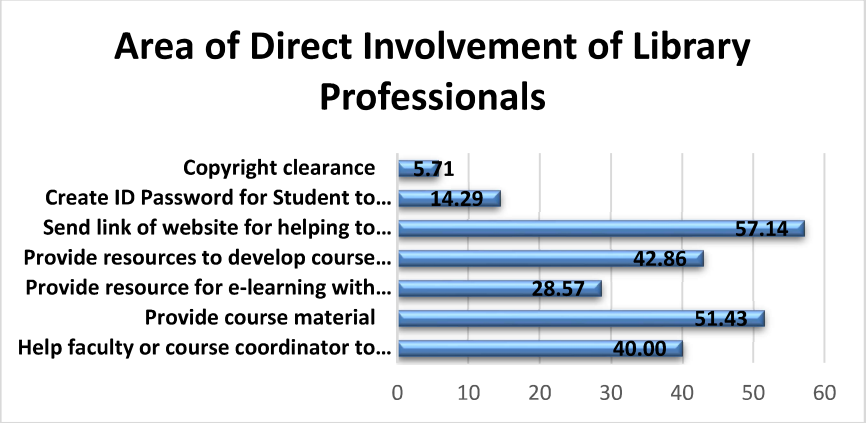

Figure 4: Area of Direct Involvement of Library Professionals

During pandemic 45.71% librarian assigned duty by their college related to e-learning

Discussion

We can see how librarians are changing their role in this pandemic, they are providing library services in online mode also, involved with extra duties assigned by their colleges related to e-learning like managing e-learning support system, giving training of how to access online platform and providing technical support, instructor of MS TEAM for cluster colleges in district wise, organize faculty awareness on online resources and study materials. So, we can say during pandemic library give their best to the students and staff for their better learning.

Conclusion

College librarians are using novel techniques to provide digital library services throughout the lockdown time, according to the survey in spite of the closure of physical facilities, the academic library has been placed at the heart of learning and research to continue to provide virtual services. Patrons have been using social media tools and programmes to access electronic resources and other services, and new ways of providing these services have emerged. It is suggested that, libraries should continue to provide virtual services so that students engaged in online learning can continue to benefit from the library's electronic information services.

Librarians should be taught how to use a different type of learning management systems so that they can interact with patrons online and assist them if they have problems accessing electronic information resources. It's also important to know how to use a variety of social media platforms, as this is where most of your customers hang out. It would then be easier to communicate with

ISBN : 978-93-5598-308-4

patrons, whether it be to provide updates or to issue warnings about the usage of digital library services. During this time library should have official social media accounts and other digital communication tools that patrons are familiar with to enhance interaction.

References

1. Guo, Y., Yang, Z., Yang, Z., Liu, Y. Q., Bielefield, A., & Tharp, G. (2020). The provision of patron services in Chinese academic libraries responding to the COVID-19 pandemic. Library Hi Tech.
2. Tsekea, S., & Chigwada, J. P. (2020). COVID-19: strategies for positioning the university library in support of e-learning. Digital Library Perspectives.
3. McTAVISH, H., & Robertson, L. (2020). Canadian Academic Librarians as Online Teachers. learning, 4, 10.
4. Jæger, M. M., & Blaabæk, E. H. (2020). Inequality in learning opportunities during Covid-19: Evidence from library takeout. Research in Social Stratification and Mobility, 68, 100524.
5. Mehta, D., & Wang, X. (2020). COVID-19 and digital library services–a case study of a university library. Digital library perspectives.
6. Journal of Innovation and Research in Educational Sciences, 7(2), 2349-5219.
7. Craft, A. R. (2020). Remote work in library technical services: Connecting historical perspectives to realities of the developing COVID-19 pandemic. Serials Review, 46(3), 227-231.
8. Sithole, N. (2014), "An assessment of the usability of the Africa university digital library, Mutare, Zimbabwe", International Journal of Emerging Trends and Technology in Computer Science, Vol. 3 No. 6, pp. 156-161
9. Hackman, D. E., Francis, M. J., Johnson, E., Nickum, A., & Thormodson, K. (2017). Creating a role for embedded librarians within an active learning environment. Medical reference services quarterly, 36(4), 334-347.

ISBN : 978-93-5598-308-4