

TO DRAW CORRELATION BETWEEN WATER CHEMICAL PROPERTIES ON SOIL PROPERTIES

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Abstract: Chemical properties (CP) of soil and water has significant impact on human health and agriculture purposes. It is important to analyze the concentration of CP frequently and manage accordingly. A systematic literature review approach was applied to analyze the relevant research from different data sources. This paper conducts a systematic review of the research work on correlation between water CP and soil properties, published and indexed in various journals till 2023. As a result, nearly 40 studies are refined in specific targeted journals are being selected and reviewed in this paper. Subsequently, this paper performs the systematic literature review upon the articles been published between January 1st 2010 to December 31th 2022 and the main themes, these articles are utilized to analyse the CP of water and soil. Through a systematic literature review, the study delineated a review of different scholarly works and theoretical reflections of CP of soil and water. . The paper also explains the selection process of articles in a systematic manner for the overall review study and the approaches utilized to execute systematic literature review. Finally, this study demonstrates the significance of frequent management of CP of water and soil and recommends future research to concentrate the relation of water on soil chemical properties.

Keywords: Chemical properties, soil, water, systematic literature review, correlation

1. Introduction

The major source of drinking water is the GW. Alternatively Groundwater (GW) is used for irrigation and industrial purposes, as there is scarcity in surface water and moreover the quality is poor (Li & Qian, 2018a, 2018b). Hence, GW is the primary source for nearly 1.5 billion population in the world (Velis, Conti, & Biermann, 2017). The quality of water is influenced by anthropogenic and geogenic sources (N Adimalla & Venkatayogi, 2017; Nageswara Rao, Appa Rao, & Subba Rao, 2017; Z. Zhang et

al., 2010), and GW quality is the important issue to human health, mainly people living in urban areas (Narsimha Adimalla & Li, 2019; Li, Li, Meng, Li, & Zhang, 2016; Y. Wang et al., 2013). The factors which affect the GW quality are activities based on land usage, geology and climate (Li, Feng, Xue, Tian, & Wang, 2017; Li, Tian, Xue, & Wu, 2017; Rao, 2014; Voutsis, Kelepertzis, Tziritis, & Kelepertzis, 2015). To apply strategies and management plans, it is vital to assess and evaluate the quality of water and its geochemical characteristics. The study of Subba Rao illustrates the causes that affects the quality of GW based on water, soil and rock interaction along with anthropogenic activities (Rao, 2014; Subba Rao, 2018). Many literatures have examined on the process and evolution of hydro-geochemical compounds in GW, it is observed that water is controlled by weather, exchange of ion and reverse ion process and dissolution of carbonates and silicate materials (Varol & Davraz, 2014).

The water sources are contaminated by high waste disposal in various forms into water which thereby contaminates the sources of water. The waste materials from industrial sector and residential locations find path into GW through leaching. Therefore, the quality of GW is required to examine regularly in these areas. The level of contamination of heavy metal is identified in GW by various analytical techniques like inductively - coupled - plasma and mass - spectrometry (ICP-MS) (Faisal, Majumder, Uddin, & Halim, 2014), direct extraction/air acetylene fame method (Rahmanian et al., 2015), fame atomic absorption spectrometry (FAAS) (Behailu, Badessa, & Tewodros, 2018) and graphite furnace atomic absorption spectrophotometer (AASGF) (Mkadmi et al., 2018) along with statistical approach like principal component analysis (PCA) (Faisal et al., 2014) statistical package for social scientists (SPSS) (Lovelyn, Egbulezu, & Chudi, 2014), least significance difference (LSD) (Sabhapandit, Saikia, & Mishra, 2010), analysis of variance (Edwin, Ibiam, okorie Igwenyi, Ude, & Eko, 2015) and single factor analysis of variance (t test) (Shigut, Liknew, Irge, & Ahmad, 2017) to evaluate the results. Most of the result delivers that there are more contamination in the GW near industrial sectors, further higher content of total dissolved solids and electrical conductivity was analysed from the samples near industrial areas than residential areas. This is because of the industries discharge heavy effluents or iconic metals from industrial heavy machine activities (Popoola, Yusuff, & Aderibigbe, 2019).

Similarly municipal waste is the rising issue in developing countries (Bru et al., 2011). Approximately 90 percent of waste are disposed in land without any proper management in disposal of waste which consequently pollutes the land, air and water (Patel & Ahluwalia, 2018). This leads to a change in CP of soil and land as it increases the concentration of chemical properties. The outcome of the existing study (Choudhury et al., 2021) highlights due to disposal of waste presence of toxic substances are identified like As, Cu, Ni, Zn, Cr, Pb, Hg in the soil and water. There are various factors affecting or changing the CP of soil like mining, microbial or bacterial effect in the soil, also due to the fertilization (Lazzaro et al., 2018; Schwab, Owensby, & Kulyingyong, 1990; Shrestha & Lal, 2011). Soil properties has particular chemical concentration like nitrogen, phosphorous, carbon and cations like magnesium, potassium, sodium and calcium. The capacity of cation changes with respect to the salinity, absorption of sodium, saturation, and enzymes.

The main objective of the research is to draw a correlation among the water CP on soil properties. The study has shown interest in analysing the influence of CP on soil and water. The study analyses various factors affecting the CP of soil and water. Further the effects of high concentration of chemical substances on agriculture, irrigation human health are analysed. This paper also summarizes the focussed areas as well. The study illustrates the physical and CP of soil and water. The paper analyses the significant research areas, and also consider as reference-point for other future research in this area.

The Systematic Literature Review (SLR) also examine and review the existing relevant articles published from 2010 to 2022 regarding the correlation among the water CP on soil properties.

2. Materials and methods

The systematic literature reviews (SLR) vary from the fixed narrative literature reviews by adopting the transparent, scientific and replicable process(Thomé, Scavarda, & Scavarda, 2016). It can also be described as the bias of minimizing procedure of the comprehensive literature searches of unpublished and published researches via delivering the assessment of the decisions, processes and outcomes of the reviewer. The most significant step in conducting the systematic literature review is to determine the inclusion criteria and exclusion criteria(White & Schmidt, 2005). Also, an investigator cannot simply integrate the random content in the SLR and is very essential to elaborate the steps involved in the identification of the relevant studies. The most commonly utilized technique is to recognize literature for need to be reviewed inside the established search like Scopus platforms or web of science and Google scholar. These popular databases involve the search for the publications using the pre-specified keywords for instance like keywords, abstracts or title. The researcher needs to carefully determine the search strategy that includes the selection of databases and keywords and also the exclusion or inclusion of books, reports, conference papers, papers and grey literature(Linnenluecke, Marrone, & Singh, 2020).

The systematic literature reviews deliver a structured and organised approach which will aid in answering the research questions. The main benefit of the SLR relies upon facilitating the fortes of the research method design to answer the significant research questions. Usually, there is always the lack of confirmation that the design procedures will enhance the design efficiency. The systematic literature reviews aids in recognizing the case studies and review the research hypotheses discovered and the outcomes attained and recognizing the unexplored research dimension. Hence, it is validated that the explicit procedure for reviews can only strengthen the research findings(Lame).The study is carried out by the method of Systematic literature-review. The requirement for the SLR research protocol is the consideration of replicability, transferability and transparency of the work, which in turn makes the literature review as the systematic one. The SLR aids in reducing the bias through performing the comprehensive literature searches. The most stimulating issue in performing the systematic literature review is the determination of the scope of research. The determination of scope of research helps in formulating the research boundaries and questions to recognize the precise research method(Mengist, Soromessa, & Legese, 2020).

The PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) has developed recently to improve the systematic review reporting quality and is used by majority of the journals and academic institutions across the world(X. Wang et al., 2019).The most generally utilized reporting guidance for the SLR that encompasses the literature search component is the PRISMA statement(Liberati et al., 2009). The PRISMA statement of 2009 checklist involves the three items associated to the SLR. Firstly, it includes the reporting of literature search that involves the description about the information sources for instance databases with coverage dates. Secondly, it involves the entire electronic search strategy for the chosen database that includes the limits utilized so that the process can be repeated. Thirdly, the number of scholarly works selected for the review process and the reasons behind this selection should be depicted in a flow diagram(Rethlefsen et al., 2021).

Step 2.1. Search Criteria

Search strategy is organised for choosing the sources from databases and suitable search terms. No specific data range is utilized and further appropriate researchers are needed to be covered. The broad selection upon different databases in online, indexing systematic literature review is regarded like Elsevier, Google Scholar and research gate. The search string created is reliant upon the synonyms of the three main concepts to the research topic examined like water chemical properties, soil properties and relation among them. Hence, the exploratory investigation of commonly used representative-synonyms were accomplished. Once the synonym selection is completed, it is then required to ensure the search process which is relevant to the research. The existing research works are selected on the basis of water chemical properties, soil properties and correlation among them. Hence, the research papers for SLR has been included based on specific inclusion criteria also specific papers have been not considered based on exclusion criteria. Table 2 illustrates the exclusion criteria. The process involved in considering the collected papers are led via PRISMA flowchart which is illustrated in figure 1 which represents numerous screening phases. Nearly 200 research papers were searched in various databases. Initially papers which are published afore the year 2010 and paper in other language apart from English are not considered in the study. Hence, based on first screening process the nearly 150 papers are considered and 50 papers are removed. The next stage is the paper which are irrelevant to the study are excluded, from this phase 100 papers were obtained. Finally 30 papers are excluded due to improper inferences and unrelated content to the study. Out of 70, forty studies are selected, as some studies do not have proper methodology and conclusion. At last, 40 studies are selected which fills the eligibility criteria of the study.

Numerous search string instances are provided for acclimating to distinct database search-syntax rules, though the similar logical value are kept in all database, the applicable option is identified to limit search process which is relevant to keyword, abstract and title. This process is regarded as the important measure to decrease the duplicated studies count or the duplicated researchers been retrieved. But, also it has been perceived that not entire set of databases that support search process constrained on keywords, that leads to inflated papers count.

The phase indulges to decide the following

Databases employed

The data sources were the papers obtained for SLR were defined as below

- Google Scholar (www.scholar.google.com.au/)
- Research Gate Portal(<https://www.researchgate.net/>)
- Elsevier Publisher (<https://www.elsevier.com/en-in>)

The publisher databases mentioned above were chosen primarily since the journals provides proficient coverage of literature that seems relevant to this SLR.

Step 2.2. Inclusion criteria and Exclusion Criteria

Inclusion criteria:

The inclusion criteria is utilized to determine the relevant articles needed to be included in SLR for analysis and criteria utilized in this SLR are enlisted below:

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- The paper must be a research paper, review paper and literature review which are published after the year 2010 also should have required content.
- The complete research works must be associated to research area or the objectives of research.

Exclusion criteria:

The exclusion criteria is utilized to determine the papers which are not relevant for the study. The exclusion criteria are stated below:

- If the articles or papers were the duplicate reports or papers of similar research study.
- The informal literature reviews which has no proper defined research question, no defined search process and not proper data extraction process.
- If the paper or research work are not written in English language.

The inclusion and exclusion criteria for the SLR is depicted in the below table 1.

Table 1. Inclusion & Exclusion criteria to choose appropriate papers

S.no	Significant considerations	Inclusion-criteria	Exclusion-criteria
1.	Time-stamp	Papers (published from 2010 to 2022)	Papers (published prior to 2010)
2.	Examination accomplished	Studies comprising of applicable research methodology and conclusions.	Studies with no proper research methodology will be excluded.
3.	Type of modality	Studies related to the water chemical properties, soil properties and correlation among them.	Studies which are irrelevant to the research topic.

Research questions

The SLR is utilized to recognize, review, assess and deduce studies related to the topics discussed in the research with the certain significant research questions. The SLR involves the systematic method of collecting, assessing, assimilating and displaying findings from the various existing researches for the specific research question. The first and foremost step in SLR is framing the research questions and on the basis of research questions, the SLR critically analyse the previous researches related to it.

Every investigation requires research question and same is applied to SLR. The research question is required to be topic oriented also in broad perspective. Moreover the research question should be specific and covers the empirical evidence. The prospects regarding justifying and framing the question for research are infinite but the researcher needs to possess the well organised research question. The reviewers are responsible to examine if the research question delivers the detailed investigation regarding the topic. Furthermore the research question is required to validate the prospects and articulate the potential to answer the research question. It is the duty of the researcher to assess if the study will inspire the argumentation. The literature type is validated similarly to other academic research. The SLR attains importance at high degree. The credible justification to the SLR is theory

based, on the basis of experimental outcomes and event based. A particular narrow research is required to carry out SLR. The ultimate aim of the SLR is to establish the evidence of previous research upon research topic related to SLR. Therefore it is vital that research question provided in SLR should collect data from selected studies and perform review to gain answer. The research question should be properly defined and the protocol should be clearly framed. These are the two significant steps in SLR. The SLR success relies upon the well-defined and appropriate research question.

This SLR accomplishes to reveal the significant solutions to the stated research questions.

RQ1: what is the influence of CP on GW?

RQ2: what is the influence of CP on soil?

RQ3: what is the correlation between the water CP and soil properties?

Step 2.3. Articles selection on the basis of PRISMA guidelines

The below table itemised the stages involved to assess and pick out the relevant papers or articles or reviews for SLR. The filtration stages in refining the entire papers were described in the table 2.

Table 2. Summary of stages of evaluating and selecting relevant papers for SLR

Filtration phases	Method	Assessment Criteria
Identification of relevant researches	Determine all the related researches from database.	search terms are included
Identification of relevant researches in stipulated time period	The elimination of studies performed based on publication date.	Exclude the studies that are published before 2000.
Smearing 1 st filtration	Selecting only related research titles to the keywords	If the title of the research includes the inputted keywords, like “water properties”, “soil properties”, “GW properties”, “soil texture”
Smearing 2 nd filtration	Deleting repeated or duplicated results	If two papers or more than that resembles the single paper, then the duplicated publications or papers were neglected.
Smearing 3 rd filtration	Selecting only related results based on the abstract	If the abstract of the study seems relevant to present research, it is included otherwise excluded.

Process of selecting studies

When the existing studies satisfies the search strategy and the inclusion criteria, then the next step involves is the selection of the studies. This step is usually performs in two stages. Initially, the reviewers examine the studies whether it matches the keywords and contains related content. In the second stage, the reviewers usually read the content of abstract and check if it matches the SLR requirements. The standard procedure for choosing studies to be included in the review are as follows,

- Combine search results
- Investigate the titles and keywords
- Recovering the full text of the selected articles
- Associate the links of multiple reports of the same research
- Read the abstract carefully and examine whether it satisfies the requirements of SLR
- Investigate the full-text documents of the selected articles
- Checking whether the studies satisfies the inclusion criteria and re-investigate if some content is missing or tampered
- Refinement of studies
- Making a decision regarding which studies need to be incorporated in the research
- The selected studies are documented and reviewed

This SLR follows the PRISMA guidelines to conduct the review. The systematic reviews usually lack the awareness of the standard guidelines which in turn makes the review as scientifically acceptable and replicable. The PRISMA delivers the typical peer accepted methodology which utilizes the checklist of guideline. The PRISMA guidelines followed by this SLR provides the quality assurance of revision procedure. This SLR executes on the basis of selection of studies criteria, search procedure, data extraction and analysis techniques.

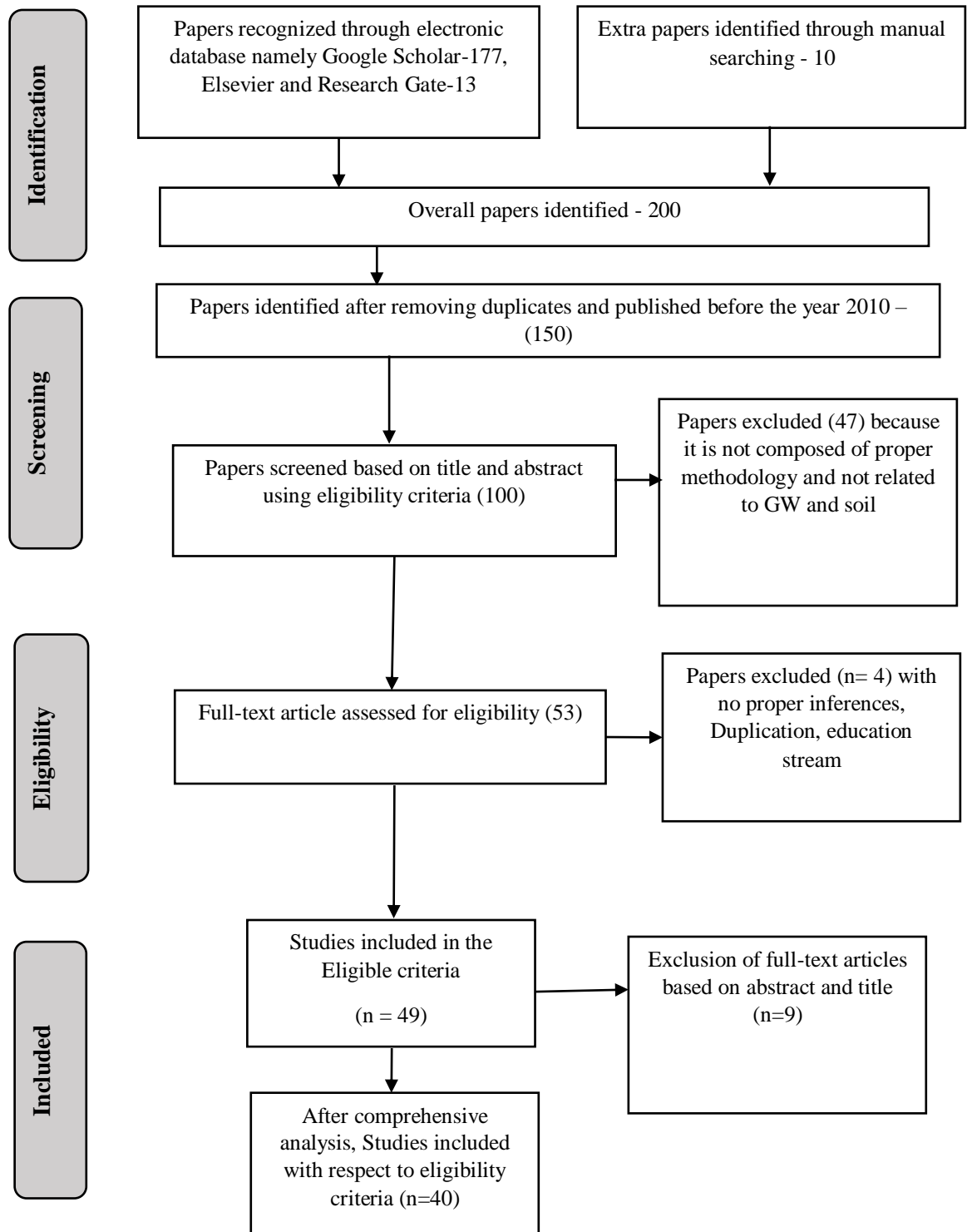


Figure 1. PRISMA guidelines for search process

Step 2.4. Quality Evaluation

The relevancy of topic has been evaluated in accordance with the exclusion and inclusion criteria. All the 100 selected papers are carefully considered with specific parameters. Each of the eligible paper encompasses the influence of CPon soil and water

All relevant papers for review possess an empirical analysis. Their outcomes are tabulated. These are projected as graphs in subsequent sections. Tables and graphs are procured through the use of several parameters that follows the research questions which are framed in below section. The selected 40 papers, from this selection knowledge are retrieved and evaluated critically on the basis of three kinds of quality evaluation question, stated as below

Q1: Does the paper cover out relevant research work and does it explores research topics comprehensively?

Q2: Does the paper offer clear implication with justifiable outcomes and their conclusions?

Q3: Does the articles, papers or reviews provided future directions?

Any selected paper from among those 69 papers had at 'yes answers to three this evaluation criteria questions were included in SLR. Out of the 49 papers, 40 papers fulfil this norms.

Step 2.5. Data Analysis

Every selected paper were analysed in accordance to scope, area of topic, summary of research question and research answers, information of author and nation. On the basis of this analysis, the chosen papers are classified to various broad areas such as the implication and prospects of CP on GW and soil.

3. Comprehensive analysis of articles concerned with analysing the influence of CP on GW and soil.

3.1 Influence of CP on GW

Many literatures have analyzed the CP of GW, as it is the main source of agriculture, irrigation and drinking purposes. The chemical concentration in water should be managed significantly and frequently. The existing study has designs the hydro geo CP to analyse the effect of Shari Lake on GW. Two sample are taken near the Lake of Shari and samples of other GW are taken from various areas in Samarra city. The samples are sent to microbial and chemical test to analyse the chemical properties. The result concludes that the GW is affected by minerals and salt which is identified in ground structure and watershed mainly limestone which is flowed in ground to dissolve minerals and salt (Theyab, Ibrahim, & Fadhil, 2020). The prevailing study provides a GW quality assessment in districts of Rupanagar where the exploitation of GW has reached to 200% (Thakur, Rishi, Naik, & Sharma, 2016). 60 samples of water are collected from wells and sent to lab for analysing the chemical properties. The study concludes that quality of GW deterioration is based on the irrigation which is not perceived in Punjab, even if there is over-exploitation of GW. Similarly, the existing study analyses the machine learning methods performance consisting of Multilayer Perceptron (MLP) Multivariate Adaptive Regression Spline(MARS), Decision Tree Regression (DTR) for evaluating the properties of physic chemical in GW (Giang, Hieu, & Do, 2021). The study collects 290 samples and analyses using MARS model. The study identifies the presence of CaCO_3 , Ca, and CO_2 in drinking 198 water which affects the human health. Further it is indicated that existence of 199 forms of chemical component is unfit for drinking.

The study of Ravikumar (Ravikumar, Somashekar, & Angami, 2011) has illustrated the GW quality's evaluation and hydrochemistry in Markandeya River stating that the evaluation of CP of GW is mainly due to weathering of rock and exchange process of reverse ion. The urbanization impact on quality of GW is explained by Arunprakash (Arunprakash, Giridharan, Krishnamurthy, & Jayaprakash, 2014) declaring that growth of population and pollution of GW are the significant issue for quality of GW deterioration. The study of Jassas and Merkel (Jassas & Merkel, 2015) has conducted a research for assessment of geo CP of GW quality which is used for irrigation and drinking purposes, the study has found that the carbonate minerals, exchange of cation, and alumina silicate are the main reason for dissolution. The study of somashekar (Ravikumar & Somashekar, 2017) has explained the GW's hydro chemical characterization by using PCA and concludes that the assessment of GW's hydrochemistry is due to the process of reverse ion exchange. Similarly the study if Varol has evaluated the quality of GW by multivariate analysis and water quality index(Varol & Davraz, 2015)

S.No	REFERENCE	OBJECTIVE	METHODOLOGY	CONCLUSION
1	(Theyab et al., 2020)	Hydro geochemical is designed in the study to analyse the effect Lake of Shari on GW in Samarra.	Two sample are taken near the Lake of Shari and samples of other GW are taken from various areas in Samarra city. The samples are sent to microbial and chemical test to analyse the chemical properties.	The study delivers that the GW is affected by minerals and salt which is identified in ground structure and watershed mainly limestone which is flowed in ground to dissolve minerals and salt.
2	(Okeke, Okoyeh, Utom, Anike, & Enekwechi, 2015)	The study evaluates the GW's physico CP from shallow wells to assess the sustainability and nature for irrigation and domestic uses.	19 samples of GW are obtained from shallow wells, the samples are transferred to lab for analysing the physic chemical properties.	The study result delivers that the physico CP except Fe ²⁺ are surrounded by the recommended values of WHO and NIS. The study further delivers that GW is sustainable for irrigation purposes.
3	(Thakur et al., 2016)	The study provides a GW quality assessment in districts of Rupanagar were the exploitation of GW has reached to 200%	60 samples of water are collected from wells and sent to lab for analysing the chemical properties.	The study concludes that quality of GW deterioration is based on the irrigation which is not perceived in Punjab, even if there is over-exploitation of GW.
4	(Khan, Syed, & Ahmad, 2022)	The study monitors and analyses water's chemical and physical parameters like odour, colour, total dissolved solid, temperature, electronic conductivity and pH, using statistical techniques	The samples are collected and monitored for analysing the physical and chemical properties. The information is then examined statistically using t test and confidence interval is produced	The result from statistical implication delivers that the dissolved solids are not accepted even though the other parameters fall in satisfactory range.

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5	(Ahmed et al., 2020)	The study shows the irrigation system suitability using spatial distribution maps by five water quality index for irrigation	Nearly 100 GW samples are collected and evaluated using IWQI, and atomic absorption 7 spectrophotometer, ultraviolet spectrophotometer and titration methods were used for 8 identification of GW quality using various parameters	The study endorses that few samples had high sodium chloride problems, salinity hazards and hazards of specific ion toxicity from sodium and chloride however no risk of sodality and bicarbonate
6	(Abduljabar & Dalaas, 2018)	The current study investigates the chemical and physical parameters of water.	The samples are collected from wells and physiochemical measurements are performed.	The study provides detail on monthly variation properties in water such as temperature of water and air, values of Turbidity and electrical conductivity values, PH values, Chloride ions values, alkalinity values.
7	(Beatrice et al., 2019)	The study examines the heavy metal properties and physic CP of GW and evaluates the suitability based on 3 norms.	The samples are collected in triplicates bimonthly and examined using standard methods.	The study results delivers that water is not suitable for consumption and should be treated appropriately before usage.
8	(Tahtouh et al., 2019)	The study analyses the non-traditional water irrigation impact on mineralogical and CP of the calcareous clayey Angelo soil	The water samples are obtained from West Texas and chemical analysis is executed at Texas A&M University Soil, Water, and Forage Laboratory	The study proves that water is suitable for arid and semi-arid regions, further there is no sign in salinity and solidity issues.
9	(Giang et al., 2021)	The study analyses the machine learning methods performance consisting of Multilayer Perceptron (MLP) Multivariate Adaptive Regression Spline(MARS), Decision Tree Regression (DTR) for evaluating the properties of physic chemical in GW	The study collects 290 samples and analyses using MARS model.	The study identifies the presence of CaCo ₃ , Ca, and Co ₂ in drinking 198 water which affects the human health. Further it is indicated that existence of 199 forms of chemical component is unfit for drinking.
10	(Nag & Das, 2017)	The study evaluates the hydro-chemical in GW to	Nearly 36 samples were obtained and the chemical	The study provides an understanding of water

		examine the quality of GW.	and physical properties were analysed via standard laboratory technique. Electrical conductivity, pH, Total Dissolved solids (TDS) are determined using pHTestr and ECTestr by Eutech Instruments and DIST using Hanna Instruments	quality and suggests for effective management and efficient in using GW resources regarding people health. The study further suggests that water quality should be monitored continuously to avoid deterioration
11	(Taher, Saleh, & Saif, 2020)	The study determines the concentration of chemical and physical properties in GW	The study collects samples from 16 wells and analyzed, in the laboratory of the water resources authority in Aden	The study delivers that most of the water in wells not suitable for consumption as concentration of some chemical substances are rich which exceeds the limit of WHO
12	(Nishimoto, Yamamoto, Yamagata, Igarashi, & Tomiyama, 2021)	To assess the acid mine drainage geochemistry and its influence on GW. The characteristics of river and GW are evaluated on the basis of cation, anion and concentration of heavy metal around mine.	water samples were taken at the mine and surrounding GWs and rivers to characterize the CP and environmental isotopes	The results showed that the quality and stable isotope ratios of AMD differed from those of GW/river water, indicating that the recharge areas of AMD.
13	(P. Liu, Hoth, Drebenstedt, Sun, & Xu, 2017)	To identify the primary hydro-geochemical processes controlling water quality,	The samples are congregated after Pangzhuang coal mine. Further samples were evaluated both on-site and in lab.	4 hydro geochemical paths were analysed. Path 1 delivers mine water origins. Path 2 confirmed relation among two deep limestone aquifers by relating the inverse modelling and water samples. Path 3 depicts the link and associations among deep and shallow GW. Path 4 indicates the pit lake water origin.
14	(Jiang, Guo, Jia, Cao, & Hu, 2015)	The study investigates the GW distribution in piedmont areas, assess factors which contributes to high concentrations of	90 samples of GW are collected from wells. Quantitative investigation was performed using Multivariate statistics	The study delivers that deep GW mostly contains low concentration of As but high concentration

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		As in GW by means of PCA and evaluates the geochemical processes controlling presence of As in GW.		of NO ₃ and U which should be evaluated constantly while used for drinking
15	(Khelif & Boudoukha, 2018)	The study contributes knowledge on hydro CP in GW in Fesdis Plain, Algeria	The study uses 28 samples of GW and multivariate statistical method, principal component analysis and cluster analysis technique is used in the study	The study depicts that statistical approach is excellent for inferring complex quality data sets for analysing the variation that are effective and useful for managing water quality
16	(Adnan et al., 2019)	The study evaluates, maps and classifies the GW quality for drinking in urban areas.	The study uses 100 samples of GW for analysing the physic CP in lab. Further the study applies classification and regression tree (CART) analysis and Hierarchal clustering analysis (HCA)	The study reveals that hardness and electrical conductivity are correlated with each other also chloride and alkalinity, chloride and total hardness, and alkalinity and chloride are correlated with each other. Most of the water are worse or good in quality. The study identifies that a few areas had the worst GW quality
17	(Azzfri et al., 2022)	The aim of the study is to conduct investigation of GW and soil in cultivation sites of rice	The study uses vertical electrical sounding approach with geo-electrical resistivity method to define the subsurface stratigraphy ranging from 1 to 180 Ωm	The result delivers that irrigation should consider characteristics of local aquifer, flow paths of GW, and nutrient transport to ensure sustainable development in agricultural areas
18	(Putranto, Susanto, & Pangestuti, 2021)	The study categorises the subsurface lithology and examines the water type of GW.	Geo-electrical survey utilizing Schlumberger array and chemical and physical properties of GW. The samples are taken from the springs and dug wells.	The geo-electrical survey results conduct 5 types of lithology with values 0 to 190 Ωm. the types are claystone, tuffaceous sandstone, tuff, sandstone, and breccia. Further the outcome of CP indicate pH ranges from 6.4 to 7.27 with electrical conductivity (EC) 71.6 to 511

				μS/cm.
19	(Embaby, Razack, Lecoq, & Porel, 2016)	The study states the hydrochemistry characterization in Egypt, based on GW physico CP occurred in rocks and sedimentary coastline of Red Sea.	35 samples of water are collected for investigating the hydro CP of GW and also to understand the sources and access on GW's chemical quality and dissolved ions in water.	The result delivers that the major association of ions are $Na^+ > Ca^{2+} > Mg^{2+}$ and $Cl^- > 2 SO_4^{2-} > HCO_3^-$ and chemical characteristics of GW are controlled by geochemical process and by anthropogenic activities.
20	(Rao et al., 2012)	The study illustrates the GW CP and also the impact of quality on health of human, plant and industrial sector is important to control and enhance the quality of water.	30 samples of water are collected in polyethylene bottles, EC meter, pH and spectrophotometer were used, and also the concentration of potassium and sodium in GW is measured.	The study has identified that the GW quality is not fit for drinking purpose as the concentration of TH, K^+ , NO_3^- , Na^+ , TDS, HCO_3^- , Cl^- , F^- , Mg^{2+} , is high than its limit, also it is not suitable for irrigation purposes.

3.2 Influence of CP on soil

Various literature researches have analysed the influence of CP of soil. The CP of soil changes when there is an uneven impact on it such as fire, disposal of waste or bacterial effect. Similar to the management of water chemical properties, soil CP should also be frequently to find the strength, salinity and saturation of soil. The prevailing study has aimed to measure different factors of aggregation on formation of soil structure at different hierarchical levels using porosity, water-stable aggregates (WSA) and dry-sieved aggregates (DSA) as indicators for aggregation at these different levels (Regelink et al., 2015). The data was collected on aggregate fractions, soil porosity, texture and chemical soil properties of 127 soil samples from three European Critical Zone Observatories. The study has identified amorphous Fe(hydr)oxides, soil organic carbon and pH are the major properties of soil which porosity and control aggregate formation in a varied range of soil types, also with quantitative relations which contribute strategies towards conserving or improving soil physical properties upon changes in soil management or land use. Another existing study has determined the physico-chemical characteristics related with the land types and soil for sustainability of agricultural production (Ufot, Iren, & Chikere Njoku, 2016). The samples of soils are collected via systematic random sampling method and the samples are sent to lab analysis. The outcome of the study delivers that different land has different effects of chemical and physical characteristics. Hence farmers can build organic crops, stabilizes aggregates of soil and enhances nutrients for sustainability. Further the study states that there is a high content of nitrogen, carbon and phosphorous is available on soil.

The prevailing study aims to evaluate the effect of biochar on soil, transformation of N and C while used as amendments (H. Zhang, Voroney, & Price, 2015). The study collected the samples from a plot. ANOVA test was performed using PROC GLM. The result of the study delivers that biochar produced at high temperature are potential to store C in soil and act as mitigation to soil GHG emissions. Similar to the previous study another study has evaluated the biochar size effect on chemical, physical and

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hydrological characteristics in loamy and sandy tropical soils (de Jesus Duarte, Glaser, & Pellegrino Cerri, 2019). The samples are collected from two different forest areas in Brazil. Graphics and statistical analysis is performed by R studio. The study reveals that size of biochar particle is crucial for retention and availability of water, distribution of pore size and C sequestration.

S.No	REFERENCE	OBJECTIVE	METHODOLOGY	CONCLUSION
1	(Regelink et al., 2015)	The goal of the study is to measure different factors of aggregation on formation of soil structure at different hierarchical levels using porosity, water-stable aggregates (WSA) and dry-sieved aggregates (DSA) as indicators for aggregation at these different levels.	The data was collected on aggregate fractions, soil porosity, texture and chemical soil properties of 127 soil samples from three European Critical Zone Observatories	The study has identified amorphous Fe-(hydr)oxides, soil organic carbon and pH are the major properties of soil which porosity and control aggregate formation in a varied range of soil types, also with quantitative relations which contribute strategies towards conserving or improving soil physical properties upon changes in soil management or land use.
2	(Zuber, Behnke, Nafziger, & Villamil, 2015)	The ultimate goal of the study is to assess the soil chemical and physical properties in typical of Illinois	Soil samples are collected in two sites namely Monmouth and Perry, this followed 5 cycles and rotation of 3 years. The statistical data are analysed using SAS software.	The study outcome has indicated that the purpose of no-tillage improves the quality pf soil.
3	(Martins et al., 2015)	The study aim to evaluate the effect of manganese mining and silicon rock powder and secondary materials from these sources on CP of soil and production of brachiaria	Samples of the soil are taken from 20 cm layers of soil. The statistical analysis was performed using SISVAR software, mathematical models to enhance the equation by using software SigmaPlot.	The result delivers that there is a higher release of K in process of mining, increase exchange of K is found in soil due to the mining waste, also the content of Mn, Zn are increased.
4	(Ufot et al., 2016)	The goal of the study is to determine the physico-chemical characteristics related with the land types and soil for sustainability of agricultural production.	The samples of soils are collected via systematic random sampling method and the samples are sent to lab analysis	The outcome of the study delivers that different land has different effects of chemical and physical characteristics. Hence farmers can build organic crops, stabilizes aggregates of soil and enhances nutrients for

				sustainability. Further the study states that there is a high content of nitrogen, carbon and phosphorous is available on soil.
5	(R. Wang et al., 2017)	The study evaluates the properties and variation among healthy soils and soils infected by bacterial wilt, comprising chemical, biological and soil microbial community	The samples are collected from 3 healthy and infected fields. The samples are sent to lab test for analysing the chemical content in the soil and for statistical analysis Canonical correspondence and Principal co-ordinates analysis are performed	The study has identified that the composition of microbial in the considered soil is different and also states that the microbial content is positively associated with the soil quality also indicates betterment in plant growth, lowers disease and increases pH value of soil.
6	(H. Zhang et al., 2015)	The aim of the study is to evaluate the effect of biochar on soil, transformation of N and C while used as amendments	The study collected the samples from a plot. ANOVA test was performed using PROC GLM	The result of the study delivers that biochar produced at high temperature are potential to store C in soil and act as mitigation to soil GHG emissions
7	(Mahmood et al., 2017)	The study has investigated the organic and inorganic effect of manures on maize and influence on physical and CP of soil.	Statistical analysis of data is performed using statistix software. The experiment is laid out in randomized complete block design (RCBD) in triplicate.	The result delivers that yield and growth of maize has enhanced substantially by application of fertilizers along with organic contents N, C, P and K increases if the fertilizers are combined with organic manures.
8	(Mulugeta, Melese, & Wondwosen, 2019)	The study assess the land type effects on specific soil chemical and physical characteristics in Kuyu district.	24 soil samples are collected. 2 way ANOVA is used to analyse the mean difference of soil chemical and physical characteristics.	The study reveals that P fertilizers supply level are vital as it enhance crop productivity.
9	(de Jesus Duarte et al., 2019)	The study evaluates the biochar size effect on chemical, physical and hydrological characteristics in loamy and sandy tropical soils	The samples are collected from two different forest areas in Brazil. Graphics and statistical analysis is performed by R studio.	The study reveals that size of biochar particle is crucial for retention and availability of water, distribution of pore size and C sequestration.

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10	(Arévalo-Gardini et al., 2015)	The study assess the long term influence of agroforestry systems on management of soil cacao chemical and physical properties.	Soil samples are taken at three different depths and statistical analysis is performed using InfoStat software.	The study outcome states that much time is required to understand the influence of traditional or natural agroforestry system in management of cacao on soil properties. The study also reveals that management of crop enhances the soil fertility storing huge amount of carbon in soil.
11	(Alcañiz, Outeiro, Francos, Farguell, & Úbeda, 2016)	The research examines the influence of fire on CP of soil in Montgri Massif	The samples are collected from distributed soil. Descriptive statistics and Kolmogorov-Smirnov test is calculated	The study has reported changes in chemical parameters of soil after fire
12	(Khadiran, Hussein, Zainal, & Rusli, 2015)	The study analyses the effect of concentration on activating agents on CP and microstructure of activated carbon in soil.	The soil was collected in area of Malaysia. The elemental content of soil samples are determined by CHNSO samples	The study results that the soil is transformed into activated carbon by zinc chloride and phosphoric acid under atmosphere of nitrogen gas.
13	(Chen, Qi, Ma, & Zhao, 2020)	The study compares various doses of biochar amendment to find optimal biochar dose for controlling bacterial wilt	The sample was collected from 10 different sites and 100g of soil is collected. The sample use to examine the chemical properties, microbial community and enzymatic activities. Statistical data is performed using SPSS software	The result of the study reveals that additions of biochar to the soil reduces the disease incidence and bacterial wilt severity
14	(Hardy et al., 2017)	The study analyses the chemical characteristics of soil extracted from preindustrial kilns in Belgium	The samples of soil are collected from 8 plots and 6 various cultivation	The result reveals that the land affects the characteristics of black carbon via modifying the conditions of soil which alternatively affects the soil kinetics and soil loss.
15	(Manivanh et al., 2017)	The research analyses the Melioidosis infection on uneven distribution of land also the physical and chemical parameters are	Samples are collected from the depth of 5,30,60,90 cm. the samples are sent to lab for analysing the physico-	The results of the study suggests that 25x25 m ² sampling grid is required to be adequate to detect the infection

		evaluated	chemical characteristics of soil and the statistical analysis is performed via R version software	at the specific location
16	(Ding et al., 2020)	The study investigate the influence of organic amendments combined with P fertilization and irrigation on physical-chemical characteristics of soil	Samples are collected from various depth and sent to physical and chemical analysis. The statistical analysis is performed using PASW statistics	The study concludes that coupling P resources along organic amendments is an excellent management and cost effective to improve soil fertility
17	(Crusciol et al., 2016)	The study aims to assess the influence of surface applications of silicate, lime, and phosphogypsum, applied on the CP of the soil in No- tillage system and to determine their effects on the nutrition, grain yield of upland rice.	The samples are collected in the region of Brazil and statistical analysis is performed via SAS software	The study reveals that silicate, lime, and phosphogypsum improves the sub surface and surface soil CP in no tillage system
18	(J. Liu, Wu, Chen, Li, & Wei, 2017)	The study analyses the quality of soil and defines the factors which limits yields	60 soil samples are collected, statistical analysis is performed via Canonical correspondence analysis	The study highlights that 32 significant differences in chemical, physical and biological characteristics of soil between various plantation stands
19	(Araújo et al., 2013)	The study aims to monitor soil microbial characteristics in degraded lands in Brazil and compare with restoration land.	Samples are taken in three different years 2009, 2010 and 2011 with 3 various level of degradation. ANOVA analysis is performed to analyse the effect of degradation level	The study reveals that land degradation highly deteriorates soil microbial characteristics and their stability in time, but that land restoration practices likely are successful in promoting the recovery of some soil microbial functions
20	(Bru et al., 2011)	The study investigates the functional microbial communities distribution involved in N-cycling, total bacterial and crenarchaeal communities in 107 places in Burgundy	42 soil physico CP are measured and analysed via canonical variation partitioning	The study shed lights on potentiality of spatially explicit method to classify the microbial activities in land.

4. Research Gaps

The shortages have been addressed from the existing studies and are listed as follows with respect to the CP of soil and water.

- The existing study has identified that there is low sodium content and low salinity in hand dug wells it is suitable for irrigation further the CP concentration in the well water is analysed, but the study has lacked to analyse pre-treatment or management process of these wells before used for domestic purposes (Okeke et al., 2015).
- The prevailing study has analysed the impact of waste water and brackish water on soil for irrigation yet lacked to focus on correlation of the clay mineralogy and soil chemistry to analyse the hydrostructural properties of the soil (Tahtouh et al., 2019).
- The existing research has estimated the physic-CP of GW but due to the limited equipment of GW the research did not detect other chemical substances that affects human health in the study area (Giang et al., 2021).
- The study has detected that cultivated crops in study area is highly concentrated with As chemical content as the crops are irrigated with As GW but the study has lacked to find the effective viable method to forecast safe aquifers as the resource for drinking water rather than just switching the wells (Jiang et al., 2015).
- The recommended study has evaluate the effect of biochar on soil but lacked to investigate soil availability and forms of C and N adsorbed to biochar surfaces and its effect in microbial community structure and function in subsequent C and N transformations (H. Zhang et al., 2015).

5. Bibliometric Analysis

With PRISMA guidelines, 40 papers have been selected for current SLR (Systematic Literature Review). Year-wise circulation of overall selected papers could be viewed in below graph (as shown in figure 2) that typically highlights the correlation of water CP on soil.

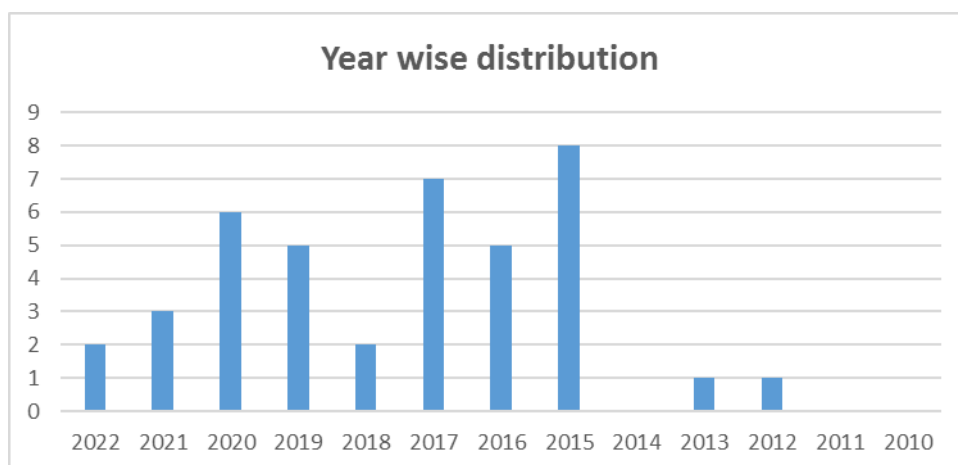


Figure 2. Year wise distribution of selected papers

From figure 2, provides information regarding the year wise distribution of paper that are selected in the research. It is exposed that, the year 2015 has found high significance in research area regarding the influence of CP in water and soil.

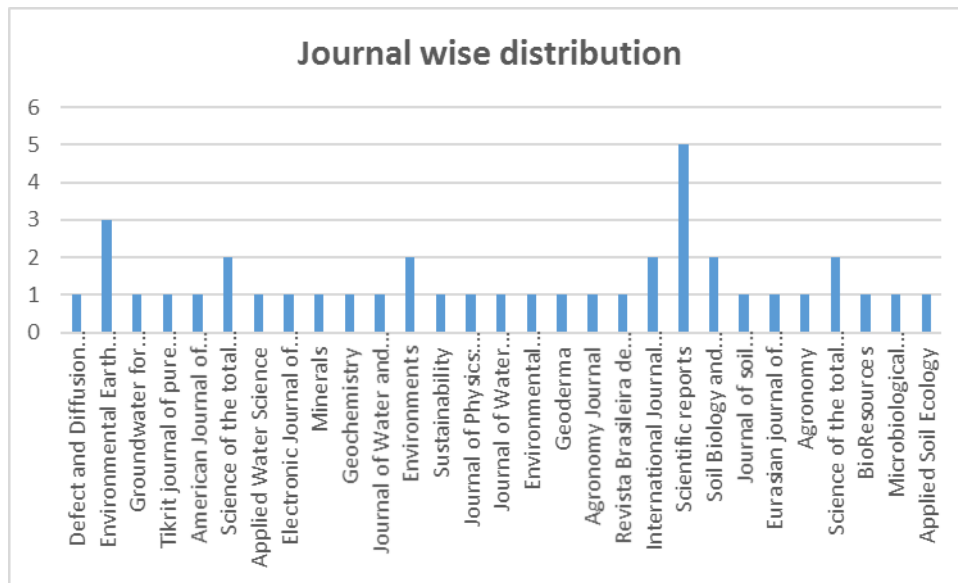


Figure 3. Journal wise distribution

Figure 3 delivers the information regarding the journal distribution of the papers used in the present study. The figure clearly states that most of the papers are from the journal scientific reports, then from environmental earth sciences.

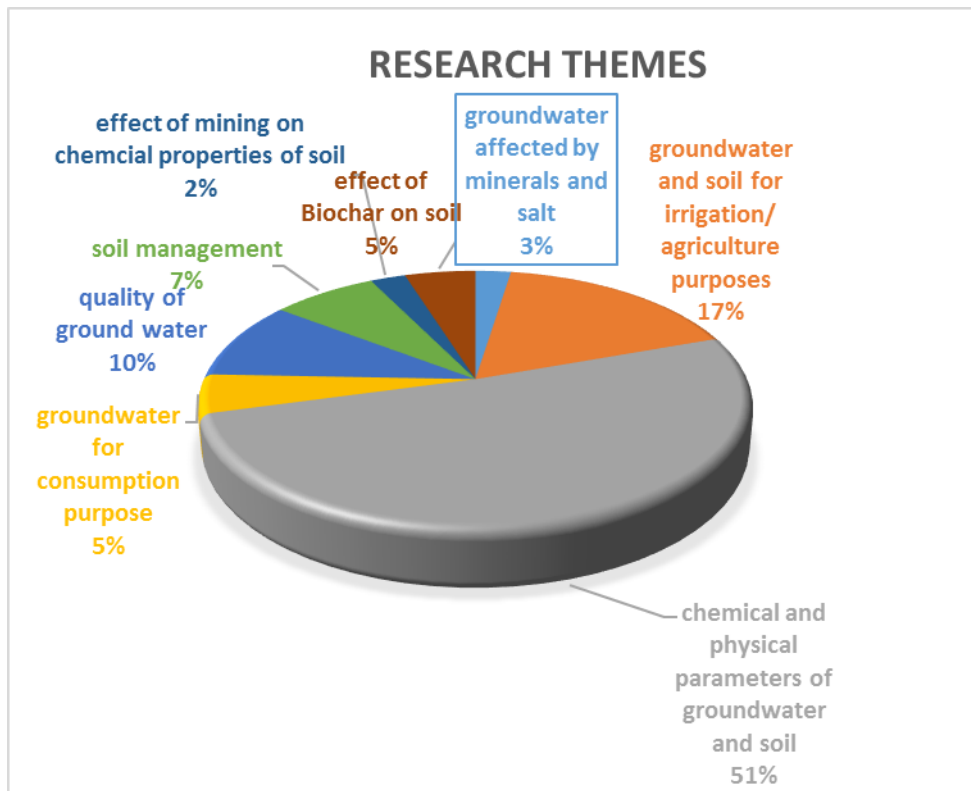


Figure 4. Research Themes

From Figure 4, it is found that the chemical and physical parameters of soil and GW has gained attention among researchers at the rate of 51%, while GW and soil has gained significance at the rate of 17%, whereas impact on CP affecting the quality of GW has gained attention with 10%, the least is effect of mining on CP of soil which is 2%.

6. Discussion and Findings

GW and soil are the main resources for industrial purposes, drinking, irrigation, and cultivation. Effective indicators and quality assessment is required to recurrently examine the quality physico-CP of soil and water, as water and soil are the main source of living and quality of life of humans. The researchers do not only examine the chemical and physical properties also the effect of these on human health is also illustrated silently. Various literatures have analysed the chemical and physical properties of soil and water separately. The limited nutrient content in land is N, which is required for regulating the mechanism of microbial communities and plant is crucial to function the ecosystem (Yuan, Niu, Weber-Grullon, & Fu, 2020). Various studies have discussed on soil pollution due to the accumulation of waste disposal on the land areas and river banks (Husein, Kalkha, Al Jradi, & Bäumlner, 2019; Nguyen et al., 2021). Similarly the impact of biochar on soil is analysed in study (Kamali et al., 2022) as it improves the soil properties and enhances the carbon content in the soil to surge the production of crops. Additionally, the study of chen compares various doses of biochar amendment to find optimal biochar dose for controlling bacterial wilt (Chen et al., 2020). The study highlights that additions of biochar to the soil reduces the disease incidence and bacterial wilt severity, effect of biochar on soil, transformation of N and C while used as amendments (H. Zhang et al., 2015). The study delivers that biochar produced at high temperature are potential to store C in soil and act as mitigation to soil Green House Gas (GHG) emissions. The study (de Jesus Duarte et al., 2019) highlights that size of biochar particle is crucial for retention and availability of water, distribution of pore size and C sequestration. Further the study (Araújo et al., 2013) highlights that the microbial content in the soil the main reason for soil degradation.

The CP of water affects and has impact on health and quality of life of human (Rao et al., 2012). The recommended study (Azffri et al., 2022) analyses the impact of GW on cultivation purposes. The study highlights that characteristics of local aquifer, flow paths of GW, and nutrient transport to ensure sustainable development in agricultural areas. Most of the literatures have analysed the impact of GW CP for irrigation purposes (Ahmed et al., 2020; Okeke et al., 2015; Tahtouh et al., 2019; Thakur et al., 2016). Also few researches have analysed the CP of water on a specific areas (Theyab et al., 2020). Furthermore studies have depicted the importance of analysing the CP of water as it has impact on human health (Shamsollahi et al., 2019).

From the overall discussion the CP of soil and water are discussed separately and the relation among these two researches are limited. Even though it is clearly stated that water properties have impact on soil, no evidence on the basis of research is observed. The literatures are limited in finding the correlation between the water CP on soil properties. The effect of water CP on soil regarding soil texture, soil infiltration, soil chemical parameters are not discussed.

7. Conclusion

Based on systematic review conducted, it is revealed that various authors have analysed the CP of soil and water and its impact when affected by pollution, bacterial or microbial agents or by any fertilizers for raising the yield of crops. The research experience shows the necessity of management of analysing

the CP of soil and GW. It is significant to measure the chemical parameters of soil and water, as these are the major resources used for irrigation, agriculture and drinking purposes. The soil and water should be managed properly to ensure the chemical concentration doesn't exceed the limit which consequently harms the soil fertilization, irrigation and drinking. Though various researchers have discussed the chemical and physical properties of soil and GW, the examination of correlation on water CP on soil properties is limited. Researchers have discussed on the CP of water which simultaneously has impact on irrigation and drinking yet the relation of water and soil is still lacking.

The impact on relation of CP of water on soil properties regarding the changes in soil infiltration, variation in texture, soil pH, soil chemical concentration and soil health is not analysed or limited by the researchers. This research recommends future researchers to analyse the correlation of water CP on soil or how water CP changes the properties of soil is needed to be examined.

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